THE PHILIPPINE JOURNAL OF SCIENCE

VOL. 43 SEPTEMBER, 1930 NO. 1

PHILIPPINE PIPERACEÆ [1]

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TWENTY-FOUR PLATES AND ONE HUNDRED TWENTY-FOUR TEXT FIGURES

INTRODUCTION

The present paper is the result of a systematic study of the Philippine plants of the family Piperaceæ. Its aim is to present in an intelligible form our present knowledge of this group as it occurs within the area indicated. From an intensive study of the abundant collections and the literature I recognize two genera, with a total of one hundred eight species, eighty-seven in *Piper* and twenty-one in *Peperomia.* This is in rather radical contrast to the late C. de Candolle's work who recognized a total of one hundred fifty-nine Philippine species in the two genera. Fourteen are proposed as new species, of which twelve are *Piper* and two are *Peperomia.* An attempt has been made to make the paper complete so far as Philippine synonymy is concerned, to account for all the species credited to the Islands by previous authors, and to cite the most important literature references under each species. An attempt also has been made to include references to all of the specimens examined.

In the arrangement of the genera I have followed C. de Candolle. In *Piper* two new sections are proposed, *Penninervia* and *Zippelia;* the first embraces all the species belonging in the group with *Piper celtidiforme,* and the latter is typified by

[1] This investigation was carried out at the University of California under a National Research Council Fellowship in the Biological Sciences.

its sole species, *Piper begoniaefolium*. I have placed *Piper copelandii* and *Piper mearnsii* under the section *Eupiper*, removing them from the section *Coccobryon* where they were placed by C. de Candolle.[2]

This study was made mainly at the University of California. The material on which it is based includes all the collections in the herbarium of the Bureau of Science, the material in the herbarium of the University of California, the Gray Herbarium, the United States National Herbarium, and the Kew herbarium, as well as various types and cotypes in certain European herbaria.

All measurements mentioned in the paper are taken from dried specimens with the exception of the bracts, the stamens, and the fruits, the measurements of which are from specimens boiled in water and allowed to dry a little. All photographs are by W. C. Matthews, photographer at the University of California, except Plates 20 to 24, which were made by the Bureau of Science. The drawings are by the author.

It is a pleasure to acknowledge the generous assistance received from many sources. Dr. E. D. Merrill, formerly dean of the College of Agriculture, University of California, under whose supervision and suggestion the study was made, has rendered invaluable aid by his many suggestions and kindly criticisms. I am indebted for the courtesies and facilities extended by the Department of Botany of the University of California. This study could not have been realized but for the aid received from the National Research Council. I am also under obligation to Dr. L. Diels, director of the Botanic Gardens, Berlin; and to Dr. K. M. Malkovsky, of the Prague herbarium, for the loan of types; and to Dr. A. W. Hill, director of the Royal Botanic Gardens at Kew; Dr. A. B. Rendle, British Museum of National History; Dr. B. P. G. Hochreutiner, of Geneva; Dr. A. A. Pulle, of Utrecht; Dr. J. W. C. Goethart, of Leiden; and Dr. F. Gagnepain, of Paris, for the courtesies extended me during my stay in their institutions.

HISTORY

The only important pre-Linnæan publication dealing with Philippine Piperaceæ is Kamel [Herbarium aliarumque stirpium in insula Luzone Philippinarum primaria nascentium . . . in Ray, Hist. Pl. 3 (1704) Suppl. 1–96], who considers and briefly

[2] Candollea 1 (1923) 174.

describes a few species, citing their local names. At the time of the publication of the first edition of Linnæus's "Species Plantarum" in 1753, only twenty piperaceous species were known, three of which are now known to occur in the Philippines. The earliest Philippine Piperaceæ described are those of Blanco, who, in his "Flora de Filipinas" ed. 1, 1837, considers five species of *Piper*. Although his descriptions are vague and imperfect I believe that they are correctly reduced here. Opiz, in Presl's "Reliquiae Haenkeanae," described nine additional species, the collection made by Haenke, a member of the Malaspina Expedition, but two of these were credited to the Archipelago on the basis of erroneously localized specimens. The next work discussing any considerable number of Philippine Piperaceæ is Miquel's "Systema Piperacearum" in 1843, in which nineteen Philippine species of *Piper* and two species of *Peperomia* are described, Miquel having available the series of Piperaceæ in the Cuming Philippine collection distributed in 1841. In 1883, F.-Villar in his "Novissima Appendix" to the third edition of Blanco's "Flora de Filipinas" enumerated thirty-four species of *Piper* and seven species of *Peperomia,* but this is merely a bibliographical list not based on actual specimens, and includes a considerable number of species that do not occur in the Archipelago. In 1885 Vidal listed eleven species of Philippine Piperaceæ with two varieties in his "Phanerogamae Cumingianae Philippinarum" and added one species a year later in his "Revisión de Plantas Vasculares Filipinas." The most-outstanding work on Piperaceæ, which included the Philippine species known up to the time of its publication in 1869, is C. de Candolle's monographic treatment of the family issued in the "Prodomus" where he admits twenty-seven species as occurring in the Archipelago. He described sixteen additional species in Perkins's "Fragmenta Florae Philippinae" in 1905, based mostly on Warburg's collection, and one in Usteri's "Beiträge zur Kenntnis der Philippinen und ihrer Vegetation" based on Usteri's collection. This earlier work was followed by the description of many new species in Elmer's Leaflets of Philippine Botany in 1910 and 1914, and in the Philippine Journal of Science in 1910 and 1916. Merrill published descriptions of three new species in 1920. The latest work of C. de Candolle on Piperaceæ, published subsequent to his death, is his "Piperacearum Clavis Analytica," which appeared in Candollea in 1923, in which the known Piperaceæ of the world are keyed out. Here also appear the names

without descriptions of the four following Philippine species: *Piper sorsogonum, Peperomia pauaiana, Peperomia ramosii,* and *Peperomia vanoverberghii.* I do not consider that these are properly published and have treated them as nomena nuda. On the basis of an actual examination of the types and isotypes, I fail to discover, except in *Piper sorsogonum,* any distinctive characters, and they have been disposed of in the synonymy of the several species that I believe they represent.

C. de Candolle, in his 1910 revision of the Philippine Piperaceæ, recognized one hundred twenty-five species, of which one hundred three are *Piper* and twenty-two *Peperomia.* Five species of *Piper* and one species of *Peperomia* were added by him in 1914, and in 1916 he proposed twenty-four additional species of *Piper* and in 1923 four others, and Merrill in 1920 described three new species of *Piper.* Thus de Candolle recognized one hundred thirty-three species of *Piper* and twenty-six of *Peperomia* as occurring in the Philippines, to which Merrill added three in 1920. Merrill, in his "Enumeration of Philippine Flowering Plants," made a very considerable number of reductions, most of which I have accepted on the basis of a critical study of the authentic material. He recognized one hundred fifteen species of *Piper,* twenty-five of *Peperomia,* and one *Zippelia,* a total of one hundred forty-one species. Although I am proposing and describing twelve new species of *Piper* and two of *Peperomia* in this paper, I am convinced that Merrill was too conservative in his reductions of the numerous more recently described species. The differences are largely the personal viewpoint as to what constitutes a species. De Candolle described numerous forms as distinct species on what I consider inadequate characters.

GEOGRAPHIC DISTRIBUTION

Ninety-two of the species recognized in this paper are apparently endemic. A large portion of the endemic species are narrowly localized; although some are widely distributed in the Archipelago, as illustrated by such species as *Piper viminale, P. philippinum,* and *P. interruptum.*

Two of the species admitted in this paper are pantropic in distribution, *Piper umbellatum* and *Peperomia pellucida,* the former possibly and the latter certainly introduced by man from tropical America. *Peperomia reflexa* is also widely distributed, extending from Polynesia to South Africa, but is manifestly of natural distribution. The only species cultivated in the Phil-

ippines are *Piper nigrum, P. betle,* and *Peperomia argyreia;* the first two originated in Indo-Malaysia, the last in tropical America. *Peperomia argyreia* and *Piper nigrum* are not found outside of cultivation, but various forms of *Piper betle* are abundant in nature, and perhaps are actually native of the Philippines.

In the Philippine Piperaceæ the percentage of endemism is high in the primary forests; yet several characteristic species are widely distributed outside of the Archipelago, particularly in Western Malaysia. There are also some endemics that are manifestly closely allied to species occurring outside of the Philippines, thus indicating probable common origins. Of the species recorded from New Guinea, *Piper celtidiforme* (*P. corylistachyon*), *P. caninum,* and *P. fragile* occur in the Philippines. It is of interest to note that *Piper celtidiforme* has not been found in Western Malaysia. On the other hand a considerable number of Philippine-Western-Malaysian species do not extend to Eastern Malaysia; such as, *Piper baccatum, P. begoniaefolium, Peperomia recurvata,* and *P. tomentosa. Piper korthalsii* and *P. abbreviatum* occur in the Philippines as well as in Western Malaysia, while *Piper arborescens* and *Piper majusculum* have a wider range, extending to Amboina; that is, Eastern Malaysia. *Piper interruptum, P. elmeri,* and *P. longivaginans* are very closely allied to some of the Western Malaysian species. In general it appears that the alliance of Philippine Piperaceæ is stronger with Western than with Eastern Malaysia.

MORPHOLOGY

PIPER

More or less scandent shrubs with woody or somewhat woody stems, rarely erect. Branches glabrous or pubescent, usually terete, canaliculate, smooth or rugose. Leaves entire, alternate; lamina membranaceous, chartaceous, or coriaceous, small (*Piper curtifolium*) or large (*Piper elmeri, P. decumanum, P. subprostratum*), linear to broadly ovate, glabrous to densely pubescent, apices obtuse or rounded to acute or acuminate, bases auriculate (*Piper aurilimbum*), acute, obtuse, or rounded, or strongly cordate (*Piper cordatilimbum*), equilateral or inequilateral, venation nerved, plinerved or penninerved; nerves and nervules prominent or obscure; petioles very short or long, entirely glabrous or densely pubescent, winged or terete; stipules usually absent.

The *Piper arborescens* group presents a unique feature in a swollen structure, which has the appearance of a gland, at the

extreme base of the lamina adjacent to the petiole. It is technically a hydathode but is usually described as an auricle or lobule. *Piper myrmecophilum* is another very characteristic species, the leaf base forming a sac, the domicile of ants, whence its scientific name.

Pistillate spikes erect or pendulous (Plate 17), short, oblong, ovoid or globose (*Piper abbreviatum*) or greatly elongated and cylindric (*Piper arborescens*). Rachis usually pubescent, rarely glabrous. Peduncles very short or long (*Piper tenuipedunculum*), slender or thick, glabrous or densely pubescent. Bracts peltate or nonpeltate, sessile or pedicellate, adnate to the rachis (*Piper interruptum*) or cupular (*Piper baccatum*), glabrous or densely pubescent; pedicels slender or stout, glabrous or pubescent. Ovary 1-celled, 1-ovuled. Fruits usually yellow or red, small (*Piper arborescens*) or large (*Piper baguionum*), concrescent or free, partly or wholly embedded in the pulp (*Piper betle*), sessile or stipitate, ovoid, ellipsoid, oblong, or globose, smooth or glabrous, tubercular, pubescent or glochidiate. Styles very short or elongated. Stigmas usually sessile or short or sometimes elongated (*Piper longistigmum*). Seeds free from the pulp or adherent, terete or angled.

Staminate spikes usually normal, sometimes pseudohermaphrodite, erect or pendulous, short or greatly elongated, cylindric. Rachis usually slender and pubescent, rarely glabrous. Bracts smaller than those of the pistillate spikes, peltate or nonpeltate, sessile or pedicellate. Stamens two or three in nearly all species (one in *Piper korthalsii,* five in *Piper baccatum,* six in *Piper begoniaefolium* and eight in *Piper sarcopodum*), usually exerted; anthers usually oblong, rarely ovoid or globose; loculi two or four; connective above the loculi usually nonabortive and thickened, in section *Penninervia* the connective enlarged; filaments usually slender, short or somewhat elongated, in *Piper korthalsii* enlarged and fleshy.

All species of the genus are more or less aromatic, with a characteristic pungent odor and taste.

PEPEROMIA

Small annual or perennial, more or less aromatic, often fleshy herbs, mostly terrestrial, few epiphytic or semiepiphytic (*Peperomia elmeri*), erect, prostrate or decumbent, simple or profusely branched, glabrous or pubescent. Leaves alternate, opposite or whorled; lamina entire, lanceolate, ovate, obovate, broadly rounded-ovate or cordate, when fresh usually more or

less succulent, thinly membranaceous, chartaceous or coriaceous when dry, glabrous to densely pubescent, venation nerved or plinerved; petioles glabrous or pubescent, without stipules.

Spikes hermaphroditic, leaf-opposed, axillary or terminal, solitary or umbellate, loosely to densely flowered. Rachis glabrous or pubescent in *Peperomia reflexa*. Bracts peltate, sessile or subsessile, disk usually orbicular, thinly membranaceous to fleshy, glabrous or pubescent. Ovary free or immersed in the rachis, ovoid to globose. Stigmas usually very minute and inconspicuous, terminal or situated below the apex or on the anterior side, single and entire, bilobed or penicillate. Fruits minute, free or immersed in the rachis, ovoid to globose, smooth, striate-costulate or verruculose. Stamens always two, usually deciduous after anthesis, anthers 2-valved, ovoid to globose, filaments short or elongated, glabrous or pubescent.

Plants in general with the same aroma as *Piper*, but the odor and the taste of the fresh material are less pronounced.

Key to the Philippine genera of Piperaceæ.

1. Woody or semiwoody, usually scandent, rarely erect shrubs or undershurbs; flowers unisexual or bisexual; vascular bundle double; leaves alternate; fruits never minute; stamens 1 to 8, anthers tetralocular or bilocular, 2- to 4-valved; bracts free, pedicellate or sessile, peltate or adnate to the rachis, with margin and apex free or cupular. 1. *Piper.*
1. Small herbaceous succulent plants; flowers bisexual; vascular bundle simple or scattered; fruits minute; stamens 2, anthers unilocular, 2-valved; bracts free, peltate; leaves alternate, opposite or whorled. 2. *Peperomia.*

Genus PIPER Linnæus

Key to the sections of Piper.

1. Bracts free, pedicellate or sessile, peltate.
   2. Spike umbellate, axillary; flowers bisexual..... § I. *Heckeria.*
   2. Spike solitary, leaf-opposed; flowers unisexual or bisexual.
      3. Connective of anthers never enlarged; lamina nerved, plinerved or penninerved.
         4. Fruits never glochidiate; stamens 2 or 3..... § II. *Eupiper.*
         4. Fruits glochidiate; stamens 6..... § VI. *Zippelia.*
      3. Connective of anthers enlarged; lamina penninerved. § V. *Penninervia.*
1. Bracts adnate to the rachis, margin and apex free; spike solitary, leaf-opposed.
   2. Filaments never enlarged; stamens 2 or 3 ..... § II. *Eupiper.*
   2. Filaments enlarged; stamen 1..... § III. *Sarcostemon.*
1. Bracts cupular; stamens 5 or 8; spike solitary, leaf-opposed. § IV. *Muldera.*

Key to the species of Piper.[3]

1. Lamina subpeltate to peltate.
   2. Spikes umbellate, axillary, numerous; flowers bisexual; lamina large, broadly ovate to suborbicular-ovate; stigmas sessile. 1. *P. umbellatum* var. *subpeltatum.*
   2. Spike never umbellate, solitary, leaf-opposed; flowers dicœcious.
      3. Lamina oblong; styles long ..... 43. *P. angustipeltatum.*
      3. Lamina elliptic-ovate to rounded-ovate; styles short. 44. *P. fragile.*

1. Lamina never subpeltate to peltate.
   2. Leaf-base subauriculate to auriculate.
      3. Lamina nerved; that is, ascending nerves leaving the midrib at the very base of the leaf; bracts pedicellate, apex of disk subulate; styles long; fruits free..... 5. *P. brevicuspe.*
      3. Lamina penninerved.
         4. Staminate spikes 4.5 to 8 cm long.
            5. Branches, petioles, and nerves on the lower surface of the lamina black; anthers subglobose..... 19. *P. aristolochiphyllum.*
            5. Branches, petioles, and nerves on the lower surface of the lamina never black; anthers oblong..... 18. *P. merrillii.*
         4. Staminate spikes 26 to 43 cm long..... 14. *P. majusculum.*
      3. Lamina plinerved; that is, ascending nerves leaving the midrib above the base of the leaf.
         4. Styles very long; leaf myrmecophilous; that is, supplied with a saclike body at the base forming a dwelling place for ants. 21. *P. myrmecophilum.*
         4. Styles subsessile to sessile; leaf never myrmecophilous.
            5. Lamina glabrous on both surfaces.
               6. Pistillate spikes 25 to 30 cm long; lamina large (28 to 43 by 11 to 25 cm), broadly oblong-ovate to broadly ovate ..... 12. *P. decumanum.*
               6. Pistillate spikes not exceeding 4 cm in length; lamina not large (15 to 30 by 2 to 3.4 cm), narrowly lanceolate. 52. *P. ensifolium.*
            5. Lamina glabrous above, pubescent beneath.
               6. Pistillate spikes greatly elongated, cylindric and slender (25 to 90 by 5 to 10 mm).
                  7. Pistillate bracts long-pedicellate.
                     8. Lamina hirsute to villose on the nerves beneath; branches glabrous to villose.
                        9. Lamina broadly ovate-elliptic, oblong-elliptic or elliptic-lanceolate (5 to 16.5 cm wide).. 10. *P. lessertianum.*
                        9. Lamina narrowly elliptic-lanceolate (2.5 to 6 cm wide). 10. *P. lessertianum* var. *oblongibaccum.*
                     8. Lamina minutely puberulent on the nerves beneath; branches minutely puberulent ....11. *P. subprostratum.*

[3] Artificial key without regard to sections.

7. Pistillate bracts subsessile to sessile; lamina pilose on the nerves and puberulent on the parenchyma; branches pilose ..... 17. *P. agusanense.*
6. Pistillate spikes oblong (15 to 43 by 6 to 11 mm).
7. Pistillate bracts long-pedicellate (1.2 to 2.5 mm long); stamens subsessile to sessile..... 18. *P. merrillii.*
7. Pistillate bracts pedicellate (0.8 to 1.2 mm long); stamens subpedicellate ..... 20. *P. aurilimbum.*
5. Lamina pubescent on both surfaces.
6. Lamina narrowly oblong-ovate to ovate-lanceolate, apex narrowed, acute, nerves beneath never dark brown; pistillate peduncles 4 to 6 mm long..... 35. *P. ramosii.*
6. Lamina oblong-ovate to ovate, apex acutely acuminate; nerves dark brown; pistillate peduncles 10 to 18 mm long. 36. *P. fuscinervum.*
2. Leaf-base equilateral to inequilateral, acute to rounded, never auriculate.
3. Lamina nerved; that is, ascending nerves leaving the midrib at the very base of the leaf.
4. Pistillate spikes greatly elongated, slender and cylindric (90 to 275 by 3 to 7 mm); fruits crowded.
5. Lamina glabrous on both surfaces, apex acutely acuminate to long and acutely acuminate.
6. Lamina ovate-lanceolate to oblong-ovate.... 2. *P. arborescens.*
6. Lamina narrowly oblong-lanceolate to elliptic-lanceolate. 2. *P. arborescens* var. *angustilimbum.*
5. Lamina glabrous above, pubescent on the nerves beneath.
6. Lamina ovate-lanceolate to oblong-ovate, apex acutely acuminate to long and acutely acuminate. 2. *P. arborescens* var. *hirtellum.*
6. Lamina elliptic to oblong-ovate, apex short and obtusely acuminate ..... 3. *P. trichophlebium.*
5. Lamina pubescent on both surfaces, apex acutely acuminate to slenderly and acutely acuminate..... 4. *P. pilipes.*
4. Pistillate spikes elongated, interrupted (30 to 175 by 8 to 15 mm), fruits never crowded.
5. Fruits glochidiate, remote; stamens 6.... 89. *P. begoniaefolium.*
5. Fruits never glochidiate and never remote; stamens 2 or 3.
6. Stigmas 5 or 6 ..... 75. *P. multistigmum.*
6. Stigmas 3 or 4.
7. Rachis pubescent.
8. Lamina lanceolate ..... 77. *P. elliptibaccum.*
8. Lamina oblong-elliptic to ovate..... 72. *P. interruptum.*
8. Lamina broadly oblong. 72. *P. interruptum* var. *laevirameum.*
8. Lamina elliptic-ovate to rounded-ovate. 72. *P. interruptum* var. *loheri.*
8. Lamina narrowly elliptic-lanceolate to narrowly oblong-elliptic ..... 72. *P. interruptum* var. *cumingianum.*

7. Rachis glabrous.
8. Lamina oblong-elliptic to ovate-elliptic; bracts oblong-obovate ..... 74. *P. pulogense.*
8. Lamina lanceolate; bracts spathulate. 76. *P. spathelliferum.*

4. Pistillate spikes short, oblong to ovoid (8 to 25 mm long); fruits somewhat crowded.
5. Lower leaves usually subpeltate; lamina elliptic-ovate to elliptic-rounded-ovate; stigmas 4 or 5..... 44. *P. fragile.*
5. Lower leaves never subpeltate; stigmas 3 or 4.
6. Lamina glabrous on both surfaces.
7. Lamina narrowly oblong-lanceolate (8.5 to 11 by 2 to 2.5 cm), base subacute, apex narrowed; fruits ovoid. 26. *P. cacuminum.*
7. Lamina narrowly linear, ovate-lanceolate or ovate (4 to 12.5 by 0.4 to 3.3 cm), base repand to cordate, apex narrowed, acute, with a minute apiculum; fruits globose to oblong-obovoid..... 25. *P. costulatum.*
7. Lamina small, ovate to elliptic-ovate (2.5 to 6.5 by 1 to 3.5 cm), base usually acute, sometimes obtuse, apex shortly and acutely acuminate; fruits globose to subglobose. 31. *P. curtifolium.*
7. Lamina elliptic-ovate (6 to 8.2 by 3 to 4.5 cm), base acute, apex shortly and obtusely acuminate; fruits globose. 32. *P. varibracteum.*
7. Lamina ovate-lanceolate to elliptic-lanceolate (6 to 15 by 1.5 to 5.5 cm), base acute to subrounded, apex attenuate; fruits oblong to oblong-ovoid..... 27. *P. halconense.*
7. Lamina oblong-ovate (6 to 7.8 by 2.5 to 3.8 cm), base acute to obtuse, apex acutely acuminate; fruits globose. 28. *P. atrospicum.*
6. Lamina glabrous above, more or less pubescent on the nerves beneath.
7. Nerves on the lower surface sparingly hirsute; lamina ovate-lanceolate to elliptic-lanceolate, base acute to subrounded, apex attenuate..... 27. *P. halconense.*
7. Nerves on the lower surface conspicuously and densely hirtellous; lamina ovate, base rounded, apex shortly and acutely acuminate ..... 33. *P. mindorense.*

3. Lamina plinerved; that is, ascending nerves leaving the midrib above the base of the leaf.
4. Pistillate spikes elongated and slender, up to 220 mm long, 3.5 to 8 mm in diameter.
5. Lamina glabrous on both surfaces.
6. Fruits crowded or somewhat crowded.
7. Lamina large (11 to 23 by 3.5 to 9.3 cm), elliptic-lanceolate to elliptic-ovate-lanceolate; pistillate spikes long (6.8 to 21.5 cm long); staminate bracts pedicellate; stamens pedicellate, anthers ovoid to globose-ovoid; fruits crowded ..... 8. *P. urdanetanum.*

7. Lamina small (7.5 to 11.8 by 1.7 to 3.3 cm), elliptic-lanceolate; pistillate spikes short (4.5 to 5 cm long); staminate bracts sessile; stamens subsessile, anthers reniform; fruits somewhat crowded ..... 9. *P. simile.*
6. Fruits laxly arranged; lamina small, ovate (7.5 to 10.8 by 3.6 to 5.8 cm); pistillate spikes short (2 to 3.6 cm long.) 16. *P. melanocaulon.*

5. Lamina glabrous above, pubescent beneath.
6. Lamina puberulent on the nerves only.
7. Lamina broadly ovate, large (21.5 to 28.5 by 15.5 to 19.5 cm), base broadly and deeply cordate; pistillate spikes greatly elongated (19.5 to 22 cm long), peduncles 10 to 15 cm long ..... 13. *P. lageniovarium.*
7. Lamina ovate, small (7.5 to 10.2 by 3.2 to 6 cm), base never cordate; pistillate spikes not greatly elongated (7 to 8.5 cm long), peduncles 3.5 to 4.6 cm long. 15. *P. eupodum.*
6. Lamina hirsute on the nerves and parenchyma, ovate-lanceolate to elliptic-lanceolate ..... 17. *P. toppingii.*
5. Lamina oblong-lanceolate, densely pubescent on both surfaces and margin ..... 6. *P. medinillifolium.*

4. Pistillate spikes not slender (7 to 90 by 5 to 25 mm).
5. Fruits not free or free only about the apex, base partly or fully embedded in and concrescent with the rachis.
6. Stigmas elongated.
7. Nerves on the lamina not sunken above; lamina brown; petioles glabrous ..... 41. *P. longistigmum.*
7. Nerves on the lamina sunken above; lamina pale; petioles pubescent to somewhat glabrous .... 40. *P. firmolimbum.*
6. Stigmas never elongated, sessile, apical.
7. Styles long ..... 42. *P. baguionum.*
7. Styles none.
8. Fruits free at the apex, base partly embedded in and concrescent with the rachis.
9. Leaves membranaceous to subcoriaceous; true staminate spikes with no pseudohermaphrodite flowers.
10. Young branches glabrous.
11. Lamina glabrous on both surfaces.
12. Lamina dark brown to black when dry; petioles vaginate their whole length. 29. *P. longivaginans.*
12. Lamina never dark brown when dry; petioles not vaginate their whole length.
13. Lamina elliptic-ovate (6 to 8.2 by 3 to 4.5 cm), chartaceous to subcoriaceous, base acute ..... 32. *P. varibracteum.*
13. Lamina narrowly linear, ovate-lanceolate or ovate (4 to 12.5 by 0.4 to 3.3 cm), membranaceous, base repand to cordate. 25. *P. costulatum.*

13. Lamina ovate-lanceolate to elliptic-lanceolate (6 to 15 by 1.5 to 5.5 cm), membranaceous, base acute to subrounded.
27. *P. halconense.*
13. Lamina narrowly ovate-lanceolate to narrowly elliptic-lanceolate (3 to 9 by 0.6 to 2 cm), chartaceous, base acute.
30. *P. delicatum.*

11. Lamina glabrous above, pubescent on the nerves beneath.
12. Lamina dark brown to black when dry; petioles vaginate their whole length.
29. *P. longivaginans.*
12. Lamina never dark brown when dry; petioles not vaginate their whole length.
13. Petioles vaginate about half-way their whole length; fruits oblong to oblong-ovoid; staminate spikes suberect, curved at the apex.
27. *P. halconense.*
13. Petioles vaginate at the base; fruits obovoid; staminate spikes erect, never curved at the apex ..... 30. *P. delicatum.*

10. Young branches pubescent.
11. Spikes hermaphroditic; that is, bearing both ♂ and ♀ flowers; lamina glabrous above, hirtellous on the nerves beneath, ovate-elliptic (12.5 to 16 by 6.5 to 9.5 cm), chartaceous, base cuneate.
47. *P. parong.*
11. Spikes dicœcious; that is, bearing only ♂ or ♀ flowers.
12. Base of the lamina acute to obtuse, never subcordate to cordate.
13. Lamina glabrous above, pubescent on the nerves beneath, narrowly ovate-lanceolate to narrowly elliptic-lanceolate; anthers globose ..... 30. *P. delicatum.*
13. Lamina pubescent on both surfaces, narrowly elliptic-lanceolate to ovate; anthers ovoid ..... 34. *P. ovatibaccum.*
12. Base of the lamina subcordate to cordate; lamina glabrous above, minutely puberulent on the nerves beneath, upper leaves elliptic-ovate, oblong-ovate or ovate.
45. *P. sarmentosum.*

9. Leaves coriaceous; staminate spikes pseudohermaphroditic; that is, bearing fertile ♂ flowers and sterile ♀ flowers.
10. Lamina elliptic-lanceolate, oblong-elliptic, subovate-elliptic, subobovate-elliptic or ovate (10 to 25 by 4.5 to 11 cm)..... 49. *P. philippinum.*

10. Lamina broadly oblong-elliptic to broadly oblong-ovate (14.5 to 28.5 by 6.5 to 18 cm). 50. *P. albidirameum.*
10. Lamina broadly elliptic-ovate to broadly rounded-ovate (14.5 to 35 by 10.5 to 27.5 cm). 51. *P. maagnasanum.*

8. Fruits not free, base or the whole embedded in and concrescent with the rachis.
9. Spikes hermaphroditic; that is, bearing both ♂ and ♀ flowers; young branches minutely puberulent; lamina glabrous above, minutely puberulent on the nerves beneath, oblong-ovate to rounded-ovate, 7- to 9-plinerved ..... 46. *P. sibulanum.*
9. Spikes dicœcious; that is, bearing only ♂ or ♀ flowers.
10. Lamina glabrous on both surfaces.
11. Pistillate spikes not shortened (2.5 to 8 cm long), apex of fruit never umbonate; seeds oblong to globose-obvoid.
12. Lamina chartaceous to subcoriaceous, oblong-ovate, oblong-elliptic, ovate or rounded-ovate (6 to 17.5 by 3.5 to 10 cm); spikes oblong to elongated oblong, up to 1 cm in diameter. 37. *P. betle.*
12. Lamina chartaceous, subovate-elliptic (5 to 7 by 1.8 to 3.8 cm); spikes oblong, up to 0.8 cm in diameter ..... 38. *P. langlassei.*
12. Lamina firmly coriaceous, oblong-ovate (8 to 12.5 by 4 to 6 cm); spikes oblong-ovoid to oblong-obovoid, up to 1.7 cm in diameter. 39. *P. asterostigmum.*
11. Pistillate spikes abbreviated (0.7 to 2 cm long); apex of fruit umbonate, the product of somewhat elongated styles; seeds obovoid, oblong-obovoid, or oblanceolate.... 22. *P. abbreviatum.*
10. Lamina glabrous above, pubescent on the nerves beneath.
11. Base of the lamina never subcordate to cordate. 46. *P. sibulanum.*
11. Base of the lamina subcordate to cordate. 37. *P. betle* var. *densum.*

5. Fruits free, sessile to stipitate.
6. Fruits borne on a cupular receptacle.
7. Cupular receptacle sessile to subsessile; stamens 5. 81. *P. baccatum.*
7. Cupular receptacle stipitate; stamens 8. 82. *P. sarcopodum.*
6. Fruits never borne on a cupular receptacle.
7. Fruits stipitate.
8. Pistillate bracts adnate to the rachis, apex and margin free.

9. Lamina glabrous on both surfaces, ovate (10 to 17 by 6.5 to 10.5 cm), base rounded; fruits not large (4 to 6.5 by 3 to 5 mm), pedicels up to 5 mm long. 70. *P. sorsogonum.*
9. Lamina glabrous above, densely and softly pubescent beneath, broadly ovate (15 to 28 by 11 to 23 cm) base deeply cordate; fruits large (7 to 9 by 6.5 to 8 mm), pedicels up to 15 mm long..... 71. *P. elmeri.*

8. Pistillate bracts never adnate to the rachis, free and peltate.
9. Bracts ciliate on the margin.
10. Fruit pedicels long, up to 9 mm. 65. *P. longipedicellatum.*
10. Fruit pedicels not exceeding 5 mm in length.
11. Lamina glabrous on both surfaces.
12. Lamina subcoriaceous, elliptic-ovate to elliptic-ovate-lanceolate; bracts ciliate above; young and old branches glabrous. 64. *P. cabadbaranum.*
12. Lamina chartaceous, narrowly linear, narrowly oblong-ovate to narrowly ovate-lanceolate in the male, oblong-lanceolate to oblong-ovate in the female; bracts glabrous above; young branches pubescent, old glabrous. 54. *P. viminale.*
11. Lamina glabrous to more or less pubescent on the midrib above, usually pubescent beneath, rarely glabrous.
12. Lamina narrowly linear, narrowly oblong-ovate to narrowly ovate-lanceolate in the male, oblong-lanceolate to oblong-ovate in the female, apex narrowed, acumen subobtuse to obtuse..... 54. *P. viminale.*
12. Lamina oblong-ovate to ovate, apex acutely acuminate ..... 53. *P. caninum.*
9. Bracts glabrous on the margin.
10. Pistillate peduncles long, up to 5 cm. 60. *P. tenuipedunculum.*
10. Pistillate peduncles not exceeding 3 cm.
11. Lamina glabrous on both surfaces.
12. Fruits fusiform; lamina lanceolate. 66. *P. arborisedens.*
12. Fruits never fusiform.
13. Acumen of lamina subobtuse to obtuse.
14. Fruits subglobose, not crowded, puberulent; branches glabrous; apex of lamina attenuate ..... 55. *P. apoanum.*
14. Fruits ellipsoid or subglobose, glabrous, crowded; branches tomentose; apex of lamina acuminate..... 56. *P. densibaccum.*

13. Acumen of lamina acute; fruits glabrous, not crowded.
14. Lamina oblong-ovate, apex acute, bracts oblong-ovate to orbicular.
57. *P. dagatpanum.*
14. Lamina elliptic-lanceolate, apex acuminate; bracts transversely elliptic.
68. *P. paucinerve.*
14. Lamina oblong-elliptic, apex acuminate; bracts orbicular.. 58. *P. dipterocarpinum.*
11. Lamina glabrous above, more or less pubescent beneath.
12. Fruits fusiform; lamina elliptic-lanceolate; young and old branches pubescent.
67. *P. acutibaccum.*
12. Fruits never fusiform; young and old branches glabrous.
13. Lamina ovate-lanceolate to oblong-subelliptic, base acute to subobtuse; fruits 3.5 to 4.5 mm long; bracts rounded-obovate to orbicular, 0.75 to 1.25 mm wide.
53. *P. caninum* var. *glabribracteum.*
13. Lamina ovate, base rounded; fruits 5 to 7 mm long; bracts transversely elliptic, 1.75 to 2.1 mm long, 1.25 to 1.75 mm wide.
59. *P. sablanum.*
11. Lamina more or less pubescent above, copiously pubescent beneath.
12. Fruits large, oblong-ellipsoid to ovoid-globose (5 to 6.5 by 3 to 4.75 mm).
13. Lamina oblong-elliptic to oblong-ovate; lower leaves never heart-shaped, dark brown; bracts oblong-ovate.... 61. *P. malalaganum.*
13. Lamina ovate, lower leaves heart-shaped, olivaceous; bracts orbicular.
53. *P. caninum* var. *latibracteum.*
12. Fruits small, ovoid, ovoid-globose to obovoid-globose (2.5 to 4.5 by 2 to 3.5 mm).
13. Lamina strictly oblong.
53. *P. caninum* var. *oblongifolium.*
13. Lamina not strictly oblong.
14. Lamina oblong-elliptic to oblong-ovate, pubescent on the nerves only.
53. *P. caninum* var. *lanaoense.*
14. Lamina pubescent on both nerves and parenchyma.
15. Fruit pedicels up to 2.75 mm long; lamina elliptic-lanceolate to elliptic-ovate, acumen acute.
53. *P. caninum* var. *hallieri.*

15. Fruit pedicles up to 1 mm long; lamina ovate to ovate-lanceolate, acumen obtuse .... 53. *P. caninum* var. *basilanum.*

11. Lamina copiously pubescent on both surfaces.

12. Lamina oblong-ovate, oblong-lanceolate, elliptic-ovate, or ovate-lanceolate, lower leaves heart-shaped, pistillate bracts orbicular. 62. *P. haenkeanum.*

12. Lamina broadly heart-shaped; pistillate bracts transversely oblong..... 63. *P. cordatilimbum.*

7. Fruits sessile, rarely subsessile.

8. Fruits without a hot taste.

9. Stamen 1, filament swollen, fleshy; fruits large, ovoid-connate, apex rostrate-attenuate.... 80. *P. korthalsii.*

9. Stamens 2 or 3, filaments never swollen; fruits small, apex never rostrate-attenuate.

10. Staminate bracts fully imbricate, stamens never exerted ..... 73. *P. davaoense.*

10. Staminate bracts never fully imbricate, stamens exerted.

11. Lamina glabrous on both surfaces; pistillate bracts adnate to the rachis, margin and apex free.

12. Lamina lanceolate..... 77. *P. elliptibaccum.*

12. Lamina narrowly elliptic-lanceolate to narrowly oblong-elliptic. 72. *P. interruptum* var. *cumingianum.*

12. Lamina broadly oblong to oblong-elliptic. 72. *P. interruptum* var. *multiplinerve.*

12. Lamina broadly ovate..... 78. *P. clemensiae.*

11. Lamina glabrous above, more or less pubescent on the nerves beneath; pistillate bracts free, sessile, peltate ..... 69. *P. brevistigmum.*

8. Fruits with a hot taste, globose, apex rounded; stamens 2, filaments not swollen.... 79. *P. nigrum* var. *trioicum.*

3. Lamina penninerved.

4. Connective of anthers never enlarged.

5. Spikes hermaphroditic; that is, bearing both ♂ and ♀ flowers; pistillate bracts sessile; rachis hirsute; stamens pedicellate.

6. Lamina glabrous on both surfaces..... 23. *P. breviamentum.*

6. Lamina glabrous above, puberulent on the nerves beneath. 23. *P. breviamentum* var. *puberulinervum.*

5. Spikes dicœcious; that is, bearing only ♂ or ♀ flowers.

6. Lamina glabrous on both surfaces; pistillate bracts sessile; rachis glabrous; stamens sessile..... 48. *P. retrofractum.*

6. Lamina glabrous above, pubescent on the nerves beneath; pistillate bracts long-pedicellate; rachis villose; stamens pedicellate ..... 24. *P. parcirameum.*

4. Connective of anthers enlarged.

5. Fruits crowded; stigmas not sessile, up to 0.5 mm long; lamina glaucous beneath.

6. Lamina glabrous on both surfaces; connective above the loculi subacute to truncate ..... 83. *P. celtidiforme.*
6. Lamina glabrous above, subglabrous to pubescent on the nerves beneath; connective above the loculi rounded.
7. Branches glabrous; lamina oblong-elliptic to lanceolate-elliptic; petioles vaginate their whole length with the base broadly vaginate and chartaceous, glabrous. 83. *P. celtidiforme* var. *vaginans.*
7. Branches pubescent; lamina lanceolate to oblong-ovate; petioles subvaginate, pubescent..... 84. *P. catubigense.*
5. Fruits never crowded; stigma sessile; lamina never glaucous beneath.
6. Lamina glabrous on both surfaces; fruits never tubercular. 85, *P. penninerve.*
6. Lamina glabrous above, pubescent beneath; fruits tubercular. 86. *P. villirache.*

Section HECKERIA

HOOK. f. in Fl. Brit. Ind. 5 (1890) 95; C. DC. in Candollea 1 (1923) 169.

Leaves broadly ovate to suborbicular-ovate, multiplinerved, bases subpeltate, deeply cordate. Spikes numerous, erect, umbellate, axillary. Flowers bisexual. Bracts free, pedicellate, peltate. Fruits sessile, crowded. Stamens 2.

1. **PIPER UMBELLATUM Linn. var. SUBPELTATUM (Willd.) C. DC. Text fig. 1; Plate 17, fig. 11.**

Piper umbellatum LINN., Sp. Pl. (1762) ed. 2, 43, var. *subpeltatum* (Willd.) C. DC. in Donn.-Sm. Enum. 6: 39, Philip. Journ. Sci. 5 (1910) Bot. 463, 11 (1916) Bot. 225, Candollea 1 (1923) 170; MERR., Enum. Philip. Fl. Pl. 2 (1923) 16.

Piper subpeltatum WILLD., Sp. Pl. 1 (1797) 166; VAHL, Enum. 1 (1805) 337; C. DC., Prodr. 16[1] (1869) 333; F.-VILL., Novis. App. (1880) 176; VIDAL, Phan. Cuming. Philip. (1885) 138; Rev. Pl. Vasc. Filip. (1886) 220.

Heckeria subpeltata KUNTH in Linnaea 13 (1839) 571.

Pothomorphe subpeltata MIQ., Comment. Phytogr. (1840) 36, Syst. Pip. (1843) 213, Nov. Act. Acad. Nat. Cur. 21 (1846) Suppl. 29, *t. 36.*

Piper umbellatum Linn. var. *glabrum* C. DC. in Bull. Herb. Boiss. 16 (1898) 494, Leafl. Philip. Bot. 3 (1910) 789, Philip. Journ. Sci. 11 (1916) Bot. 225, Candollea 1 (1923) 170; MERR., Enum. Philip. Fl. Pl. 2 (1923) 16.

Piper peltatum USTERI, Beitr. Ken. Philip. Veg. (1905) 125 (sphalm) non Linn.

Erect, suffrutescent, 1 to 2 meters high; the branches glabrous, thick, glandular, subterete, canaliculate. Leaves membranaceous, with conspicuous glandular brown to black dots beneath, broadly ovate to suborbicular-ovate, 17 to 37.5 cm

long, 15 to 32 cm wide, base subpeltate, multiplinerved; equilaterally deeply cordate, lobes rounded, apex shortly and acute acuminate, hirtellous on the nerves on both surfaces, margin ciliate, reticulations prominent on both surfaces; petioles very long, more or less hirtellous, 11.5 to 27.5 cm long. Spikes numerous, umbellate, axillary, erect, hermaphroditic, 5.5 to 12 cm long, 2 to 3.5 mm in diameter; main branch of the inflorescence puberulent, 1.2 to 4 cm long, the peduncles of the spikes slender, 5 to 12 mm long; rachis glabrous; bracts pedi-

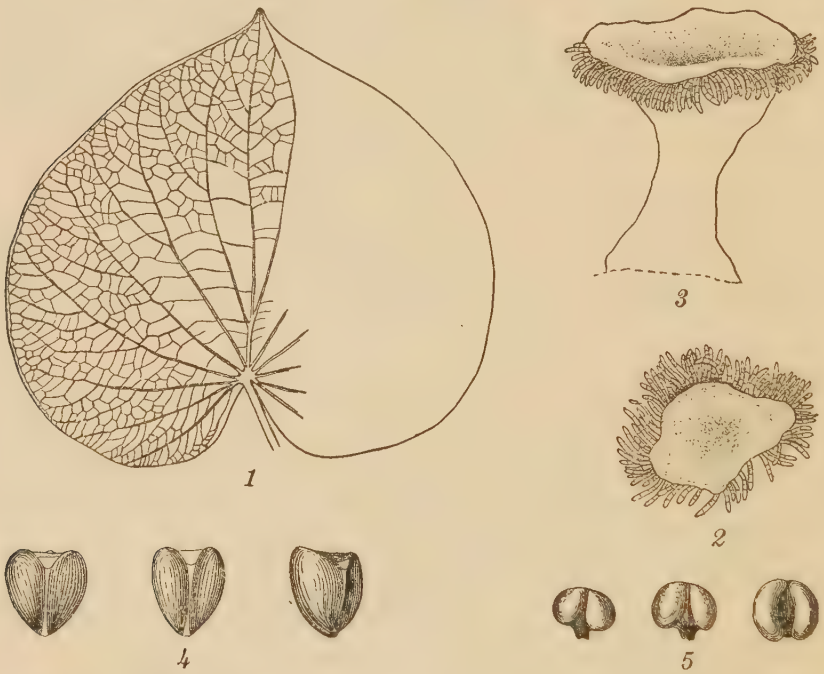

FIG. 1. *Piper umbellatum* Linn. var. *subpeltatum* (Willd.) C. DC.; *1*, leaf, × 0.25; *2*, top view of bract, × 5; *3*, side view of bract, × 5; *4*, seeds, × 12.5; *5*, stamens, × 40.

cellate, peltate, about 1 mm long, disk semilunar, triangular, margin ciliate, subfleshy, about 0.5 mm wide; fruits free, crowded, obovoid-trigonous, 0.75 to 1 mm long, about 0.5 mm in diameter, glandular, apex truncate, umbonate; stigmas, cuspidate; stamens 2, subsessile, minute, up to 0.2 mm long, anthers subglobose, bilocular, 2-valved, filaments very much shorter than the anthers.

LUZON, Ilocos Norte Province, Bangui, *Bur. Sci. 7711 Ramos:* Isabela Province, San Mariano, *Bur. Sci. 47252 Ramos and Edaño:* Apayao Subprovince, Aguimi, *Bur. Sci. 28138 Fénix:*

Bontoc Subprovince, Antadao, *Vanoverbergh 383:* Benguet Subprovince, Sablan, *Bur. Sci 12694 Fénix:* Bulacan Province, Babuan, Maon River, *Philip. Pl. 1940 Ramos:* Bataan Province, Lamao River, Mount Mariveles, *Williams 334:* Rizal Province, Bosoboso, *Bur. Sci. 1018 Ramos, For. Bur. 3315 Ahern's collector;* Antipolo, *Bur. Sci. 20986 Ramos;* Montalban, *Loher 13412;* Caysusot, *Philip. Pl. 42 Ramos:* Laguna Province, Paete, *Bur. Sci. 22827, 22846 McGregor;* near Fami, *Bur. Sci. 23183 McGregor;* Pililla-Mabitac trail, *Bur. Sci. 11946 Robinson and Ramos;* Los Baños, *Bur. Sci. 6723 Robinson, Baker 380;* Mount Maquiling, *Bur. Sci. 16897 Siriñas, Foxworthy, and Forestry Squad 11, For. Bur. 20872bis Villamil, Elmer 17594;* Calauan, *Cuming 441, Bur. Sci. 12414 McGregor;* Lazaan, *Bur. Sci. 6030 Robinson:* Sorsogon Province, Irosin, Mount Bulusan, *Elmer 15625.* MINDORO, Mount Cabignayan, *For. Bur. 8678 Merritt;* Paluan, *Bur. Sci. 39595 Ramos.* PANAY, Capiz Province, Jamindan, *Bur. Sci. 31253 Ramos and Edaño:* Libacao, *Bur. Sci. 35404 Martelino and Edaño:* Antique Province, Culasi, *Bur. Sci. 5915 McGregor.* CAMIGUIN DE MINDANAO, Canangcaan, *Bur. Sci. 14723 Ramos.* MINDANAO, Bukidnon Province, Sumilau, *Bur. Sci. 15787 Fénix;* Mount Candoon, *Bur. Sci. 38767 Ramos and Edaño:* Lanao Province, Lake Lanao, Camp Keithley, *Clemens 621:* Davao Province, Catalogan, *Copeland 930;* Todaya, Mount Apo, *Copeland 1252:* Zamboanga Province, Sax River, *Williams 2144.* BASILAN, *Bur. Sci. 15456 Reillo.* JOLO, Mount Dajo, *Merrill 5330.* In damp forests at low and medium altitudes. Pantropic.

Local names: Balai (Bon.); bayag-bayág (C.Bis.); dijarán (Ig.); gumba (Sol.); kamámba (Tag.); kubámba (Tag.); kubánbang-damó (Tag.); kúyo (Bag.); kúyok (Bag.); pugápong (Buk.); tobayág (P.Bis.).

This is the only species of *Piper* in the Philippines with umbellate spikes. I agree with C. de Candolle in calling the Philippine form var. *subpeltatum.* It is characterized among the Philippine pipers by its erect habit, never scandent, its very large thin leaves, and numerous umbellately arranged spikes.

Section **EUPIPER**

C. DC. in Prodr. 16[1] (1869) 339, Candollea 1 (1923) 176.

Leaves of various form, nerved, plinerved or penninerved, base acute to cordate or peltate. Spikes solitary, leaf-opposed, greatly elongated, cylindric and slender to globose-ovoid, or long and interrupted. Flowers unisexual, dicœcious, rarely bisexual.

Bracts free, pedicellate or sessile, peltate, or adnate to the rachis with margin and apex free. Fruits free, crowded to very loosely disposed, sessile or pedicellate or embedded in pulp. Stamens 2 or 3. Stigmas usually 3 or 4, rarely 5 or 6.

2. PIPER ARBORESCENS Roxb. Text fig. 2; Plate 17, fig. 5.

Piper arborescens Roxb. in Hort. Beng. (1814) 80, Fl. Ind. 1 (1820) 161, ed. 2, 1 (1832) 159; C. DC., Prodr. 16[1] (1869) 358; Merr., Interpret. Herb. Amb. (1917) 180, Enum. Philip. Fl. Pl. 2 (1923) 3.

Piper miniatum Blume in Verh. Bat. Genoots. 11 (1826) 166; C. DC. Prodr. 16[1] (1869) 354, Leafl. Philip. Bot. 3 (1910) 766, Philip. Journ. Sci. 5 (1910) Bot. 422 (incl. formae *b*, *c*, and var. *hirtellum* C. DC.), 11 (1916) Bot. 208, Candollea 1 (1923) 181; F.-Vill., Novis. App. (1880) 175; Vidal, Phan. Cuming. Philip. (1885) 138, Rev. Pl. Vasc. Filip. (1886) 219.

Piper glandulosum Opiz in Presl Rel. Haenk. 1 (1828) 158.

Chavica miniata Miq., Syst. Pip. (1843) 234, Nov. Act. Acad. Nat. Cur. 21 (1846) Suppl. 32, *t. 28*, Fl. Ind. Bat. 1[2] (1858–59) 440.

A dicœcious vine; the branches glabrous, smooth, terete, canaliculate, pale to black, 1.5 to 3 mm in diameter. Leaves chartaceous to subcoriaceous, ovate-lanceolate to oblong-ovate, 11 to 22.5 cm long, 3.5 to 8.5 cm wide, glabrous on both surfaces, base equilaterally to subequilaterally subacute to rounded, usually with one minute auricle or lobule, 5- to 7-nerved, apex acutely acuminate to long and acutely acuminate, reticulations prominent; petioles glabrous to slightly puberulent, rugose, 2.5 to 10 mm long, in the lower leaves up to 15 mm long. Pistillate spikes greatly elongated, cylindric and slender, pendulous, 9.5 to 27.5 cm long, 3 to 7 mm in diameter; the peduncles glabrous, 2.5 to 7 cm long; rachis hirsute; bracts long-pedicellate, peltate, 1.2 to 1.8 mm long, disk orbicular, glabrous above and on the margin, 0.5 to 0.8 mm wide, pedicel 1 to 1.2 mm long, fleshy, hirsute; fruits free, crowded, sessile, oblong to oblong-ovoid, angular, 1.8 to 2 mm long, 0.6 to 0.8 mm in diameter, apex subacute to obtuse, glabrous, stigmas 3 or 4, sessile, apical; seeds oblong to oblong-ovoid, mucronate, 1.2 to 1.5 mm long, 0.5 to 0.6 mm in diameter. Staminate spikes pendulous, 15.5 to 24.5 cm long, 2 to 2.5 mm in diameter; the peduncles glabrous, 2 to 4.5 cm long; rachis hirsute; bracts subsessile to sessile, peltate, disk orbicular to suborbicular, glabrous above and on the margin, 0.6 to 0.9 mm wide; stamens 2 or 3, subpedicellate, about 0.5 mm long, anthers reniform, tetralocular, 2-valved, filaments slightly longer than the anthers.

Luzon, Abra Province, Mount Paraga, *Bur. Sci. 7205 Ramos:* Apayao Subprovince, Ngagan, *Bur. Sci. 28116 Fénix:* Rizal

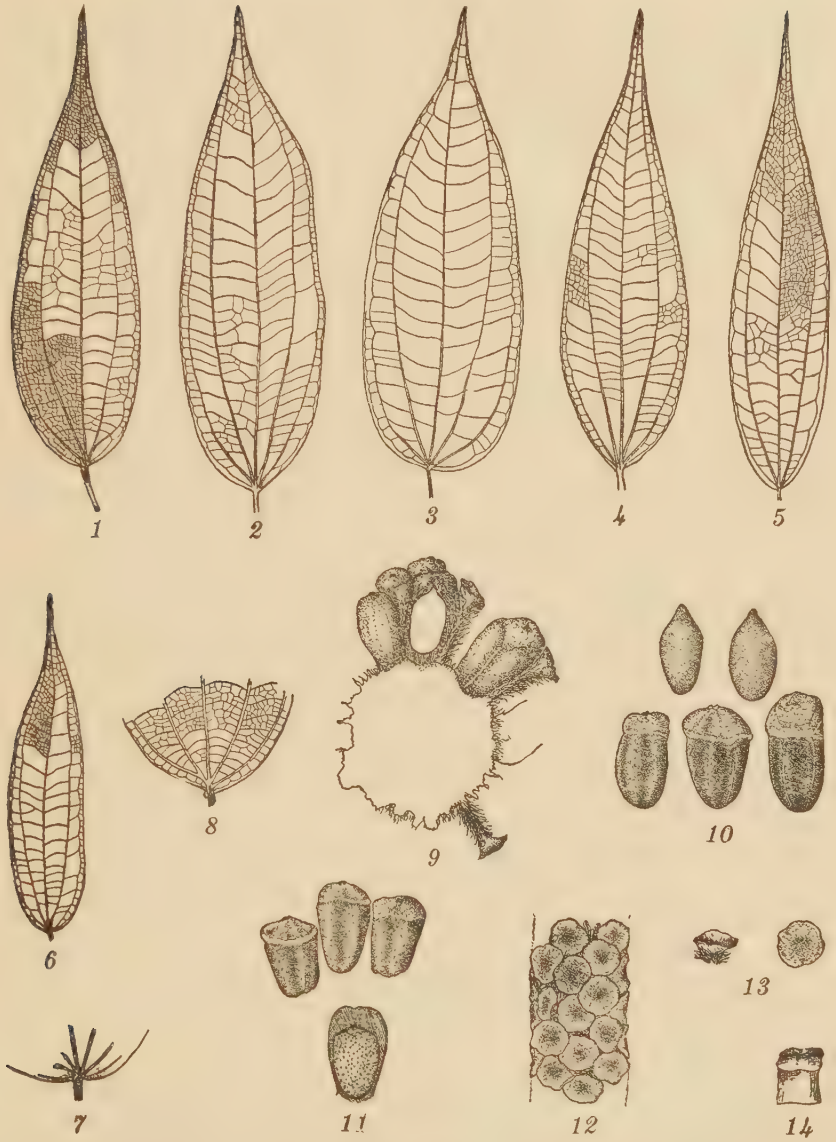

FIG. 2. *Piper arborescens* Roxb.; *1–4*, leaves, × 0.5; *7*, leaf base, upper surface, × 0.5; *8*, leaf base, lower surface, × 0.5; *9*, mature pistillate spike, transverse section, × 7.5; *10*, fruits and seeds, × 7.5; *12*, portion of mature staminate spike, × 5; *13*, side and top views of staminate bracts, × 7.5; *14*, stamen, × 15; var. *angustilimbum* var. nov.; *5–6*, leaves, × 0.5; *11*, fruits, × 7.5.

Province, Montalban, *Loher 12177:* Laguna Province, San Antonio, *Bur. Sci. 12018 Ramos;* Los Baños, Mount Maquiling, *Elmer 17532, 18027:* Tayabas Province, without definite locality, *Vidal 510:* Albay Province, without definite locality, *Cuming*

841: without definite locality, *Haenke s. n.* (type of *Piper glandulosum* Opiz in herb. Prague). MINDORO, Pinamalayan, *Bur. Sci. 40817 Ramos.* SAMAR, without definite locality, Cuming *1708;* Loquilocon, *Bur. Sci. 43775, 43786, 43878 McGregor;* Cauayan, *Bur. Sci. 17526 Ramos.* LEYTE, Jaro, Buenavista, *Wenzel 866, 721;* Tacloban, *Wenzel 1733.* PANAY, Capiz Province, Mount Madiaas, *Bur. Sci. 30629 Ramos and Edaño;* Jamindan, *Bur. Sci. 31065, 31080, 31166, 31365 Ramos and Edaño;* Agsaman, *Bur. Sci. 46098 Edaño.* MINDANAO, Surigao Province, Placer, *Wenzel 2902, 3212:* Agusan Province, Cabadbaran, Mount Urdaneta, *Elmer 13378, 13661:* Bukidnon Province, Sumilao, *Bur. Sci. 15747 Fénix;* Mount Candoon, *Bur. Sci. 33826 Ramos and Edaño;* Tangkulan, Agusan River, *Bur. Sci. 39132 Ramos and Edaño;* Lanao Province, Lake Lanao, Camp Keithley, *Clemens s. n.* Common in forests at low and medium altitudes, ascending to 1,000 meters. Malay Peninsula and Archipelago.

Local names: Lauiñgan (Buk.); manlakbayan (Mbo.); opoi (Mbo.); parong (S.L.Bis.).

Merrill's reduction of *Piper miniatum* Blume to a synonym of *Piper arborescens* Roxb. is correct. The Rumphian illustration is decidedly out of proportion, the leaves and spikes being reduced; the description is good. This illustration is the whole basis of *Piper arborescens* Roxb. as originally published in Hortus Bengalensis (1814) 80.[4] The species was later described by Roxburgh from specimens collected in the Moluccas, the reference to Rumphius being included in the description. The original description applies to the above specimens in all respects. C. de Candolle later referred specimens collected in Borneo, Java, and Ceylon to *Piper arborescens* Roxb., apparently basing his description on this material. The actual Amboina specimens collected by Robinson were identified by C. de Candolle as *Piper miniatum* Blume which is a synonym of *Piper arborescens* Roxb.

This species is strongly characterized by its greatly elongated, cylindric, and slender pistillate spikes, its prominently nerved leaves and the presence of a minute auricle or lobule at the base of the lamina.

Var. ANGUSTILIMBUM var. nov.

Foliis anguste oblongo-lanceolatis ad elliptico-lanceolatis, apice attenuatis, acutis.

[4] See C. B. Robinson in Philip. Journ. Sci. 7 (1912) Bot. 415.

Branches glabrous, smooth. Leaves chartaceous, narrowly oblong-lanceolate to lanceolate-elliptic, 7 to 17 cm long, 1.5 to 4.5 cm wide, glabrous on both surfaces, base equilaterally to subequilaterally subacute to acute, apex acutely attenuate. Pistillate spikes sometimes as much as 8 cm long; pistillate bracts 1.2 to 1.5 mm long, disk 0.5 to 0.7 mm wide.

LUZON, Ilocos Norte, Bangui to Claveria, Mount Calvario, *Bur. Sci. 33050 Ramos:* Rizal Province, without definite locality, *Loher 14419;* Mount Lumutan, *Bur. Sci. 29671 Ramos and Edaño:* Laguna Province, San Antonio, *Bur. Sci. 14988 Ramos:* Tayabas Province, Lucban, *Elmer 7384* (type in herb. Manila), *7910:* Sorsogon Province, Irosin, Mount Bulusan, *Elmer 16142.* SAMAR, Amabalate, *Bur. Sci. 17586 Ramos;* Catubig River, Pinipisakan, *Bur. Sci. 24330 Ramos.* LEYTE, Dagami, *Bur. Sci. 15256 Ramos;* Jaro, Buenavista, *Wenzel 914.* PANAY, Capiz Province, Mount Salibongbong, *Bur. Sci. 35620 Martelino and Edaño;* Mount Bulilao, *Bur. Sci. 35688, 35723, 35736, 35737, 35745, 35751, 35761 Martelino and Edaño.* MINDANAO, Zamboanga Province, Sax River, *Merrill 8106.* In forests at low and medium altitudes, ascending to 1,000 meters.

This variety differs from the species by its narrowly oblong-lanceolate to lanceolate-elliptic leaves.

Var. HIRTELLUM (Miq.) Merr.

Piper arborescens Roxb. var. *hirtellum* (Miq.) MERR., Enum. Philip. Fl. Pl. 2 (1923) 3.

Piper miniatum Blume var. *hirtellum* C. DC. in Leafl. Philip. Bot. 3 (1910) 776, Philip. Journ. Sci. 5 (1910) Bot. 422, Candollea 1 (1923) 261.

Chavica miniata Miq. var. *hirtella* MIQ., Fl. Ind. Bat. Suppl. (1860–61) 473.

Branches and petioles hirsute. Leaves glabrous above, hirsute on the nerves beneath. Peduncles glabrous to sparingly hirsute.

LUZON, Bataan Province, Mount Mariveles, near Camp Borden, *Leiberg 6077;* Mount Mariveles, *Elmer 6683;* Lamao River, Mount Mariveles, *Whitford 504:* Laguna Province, San Antonio, *Bur. Sci. 21974 Ramos:* Tayabas Province, hills near Malinao, *Baker 3250;* Casiguran, Mamatoc River, *Bur. Sci. 45542 Ramos and Edaño;* Mount Binuang, *Bur. Sci. 28753 Ramos and Edaño:* Sorsogon Province, Irosin, Mount Bulusan, *Elmer 15869.* SAMAR, Catbalogan, *Bur. Sci. 17439, 17575 Ramos;* Paranas, *Bur. Sci. 17645 Ramos;* Mount Capotoan, Catubig River, *Bur.*

Sci. 24310 Ramos; Las Naras, Catubig River, *Bur. Sci. 24521 Ramos.* LEYTE, Dagami, Panda, *Wenzel 352;* Tigbao, *Wenzel 1461;* Tacloban, *Wenzel 1705, 1743.* MINDANAO, Davao Province, Todaya, Mount Apo, *Elmer 11229:* Zamboanga Province, Malangas, *Bur. Sci. 34342 Ramos and Edaño.* BASILAN, *Bur. Sci. 15466 Reillo.* In forests at low and medium altitudes, ascending to 750 meters. Sumatra.

Local names: Mangolas (Sub.); parong (S.L.Bis.).

This variety differs from the species by its pubescent branches, petioles, and leaves.

3. **PIPER TRICHOPHLEBIUM** sp. nov. Text fig. 3; Plate 1.

Frutex dioicus, scandens; ramulis 2 ad 3 mm diametro; foliis breviter petiolatis, chartaceis, ellipticis ad oblongo-ovatis, 10.5 ad 14 cm longis, 5 ad 7.2 cm latis, basi aequilateralibus ad subaequilateralibus subacutis ad rotundatis, 5-nerviis, apice brevissime obtuse acuminatis, supra glabris, subtus ad nervo dense pilosis; spicis ♀ gracilis, 15 ad 18 cm longis, 4 mm diametro; rachis pilosis; pedunculis 3 ad 3.5 cm longis, pilosis; bracteis longe pedicellatis, peltatis, 1.2 ad 1.4 mm longis, peltis, suborbicularis, supra marginibusque glabris, 0.5 mm latis, pedicillis longe pilosis; baccis oblongis, 4- vel 5-angulatis, 1 ad 1.6 mm longis, 0.6 ad 0.8 mm diametro; stigmatibus 3 vel 4.

A dicœcious vine; the branches pilose, terete, shallowly canaliculate, pale brown when dry, 2 to 3 mm in diameter. Leaves chartaceous, elliptic to oblong-ovate, 10.5 to 14 cm long, 5 to 7.2 cm wide, base equilaterally to subequilaterally subacute to rounded, 5-nerved, apex shortly and obtusely acuminate, glabrous above, densely pilose on the nerves beneath, margin glabrous, reticulations rather prominent beneath; petioles short, 4 to 5 mm long, the lower ones 10 to 12 mm long, densely pilose. Pistillate spikes greatly elongated, cylindric and slender, pendulous, 15 to 18 cm long, about 4 mm in diameter; the peduncles much longer than the petioles, sparsely pilose, 3 to 3.5 cm long; rachis pilose; bracts long-pedicellate, peltate, 1.2 to 1.4 mm long, disk suborbicular, denticulate, glabrous above and on the margin, about 0.5 mm wide, pedicel long, pilose; fruits free, crowded, oblong, 1 to 1.6 mm long, 0.6 to 0.8 mm in diameter, somewhat 4- or 5-angled; stigmas 3 or 4, appressed on the apex of the fruit, acute or obscurely coalescing into one at the maturity of the fruits.

PALAWAN, Binaloan, *Merrill 9404,* May 19, 1913 (type in herb. Manila), in forests at low altitudes.

This species is closely related to *Piper arborescens* Roxb. var. *hirtellum* (Miq.) Merr. from which it is distinguished by its elliptic to oblong-ovate leaves, which are shortly and obtusely acuminate and its oblong, somewhat 4- or 5-angled fruits.

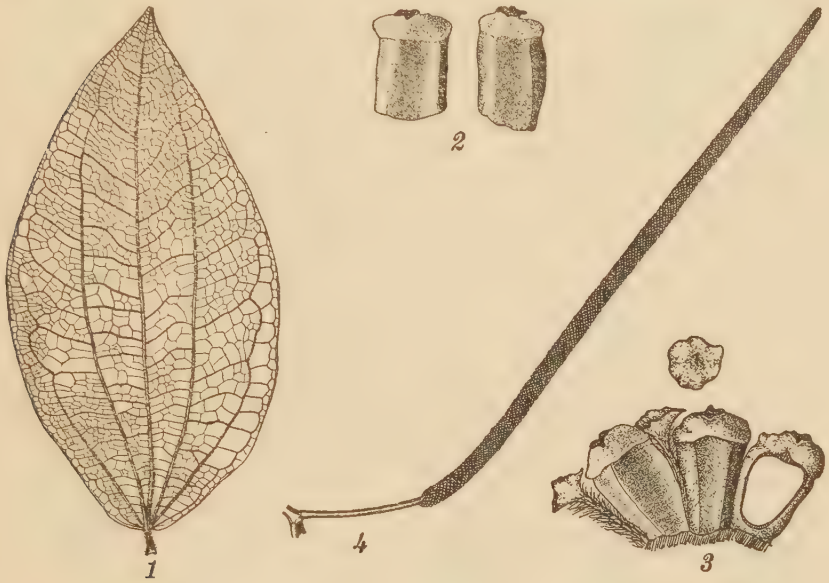

FIG. 3. *Piper trichophlebium* sp. nov.; *1*, leaf, × 0.5; *2*, fruits, × 10; *3*, portion of the transverse section of mature pistillate spike, × 10; *4*, mature pistillate spike, × 0.5.

4. PIPER PILIPES C. DC. Text fig. 4.

Piper pilipes C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 423, 11 (1916) Bot. 209, Candollea 1 (1923) 269; MERR., Enum. Philip. Fl. Pl. 2 (1923) 16.

A dicœcious vine; the branches villose, terete, brown when dry, 1.5 to 2.5 mm in diameter. Leaves chartaceous, oblong, oblong-ovate to oblong-elliptic, 11 to 15 cm long, 3 to 7 cm wide, base equilaterally subacute to rounded, 5-nerved, apex acutely acuminate to slenderly acutely acuminate, villose on both surfaces, reticulations prominent beneath; petioles short, densely villose, 5 to 7 mm long, in the lower leaves up to 15 mm long. Pistillate spikes greatly elongated, cylindric and slender, pendulous, 12 to 14 cm long, 4 to 6 mm in diameter; the peduncles much longer than the petioles, densely villose, 2.5 to 4 cm long; rachis

hirsute; bracts long-pedicellate, peltate, 1.2 to 1.4 mm long, disk suborbicular, glabrous above and on the margin, margin undulate, about 0.5 mm wide, pedicel long, hirsute; fruits free, crowded, oblong-obovoid, glabrous, apex truncate to rounded, about 1.5 mm long, 0.6 to 0.75 mm in diameter; stigmas 3, minute, sessile, apical.

FIG. 4. *Piper pilipes* C. DC.; *1–2*, leaves, × 0.5; *3*, side and top views of bracts, × 10; *4*, seed, × 10; *5*, fruits, × 10; *6*, mature pistillate spike, × 0.5.

POLILLO, Polillo, *Bur. Sci. 6914 Robinson.* LEYTE, Jaro, Buenavista, *Wenzel 717, 894, 948.* MINDANAO, Lanao Province, Lake Lanao, Camp Keithley, *Clemens s. n.* (type collection): Davao Province, Mount Mayo, *Bur. Sci. 49472 Ramos and Edaño.* In forests at low and medium altitudes, ascending to 700 meters. Endemic.

A species manifestly allied to *Piper arborescens* Roxb. but recognized by its brown villose leaves, petioles, and peduncles and the long stiff hairs on the pedicel of the bracts.

5. PIPER BREVICUSPE (Miq.) Merr. Text fig. 5.

Piper brevicuspe (Miq.) MERR., Enum. Philip. Fl. Pl. 2 (1923) 5.
Rhyncholepis brevicuspis MIQ., Syst. Pip. (1843) 283, Nov. Act. Acad. Nat. Cur. 21 (1846) Suppl. 46, *t. 45*, Fl. Ind. Bat. 1³ (1858–59) 447.

Piper rhyncholepis C. DC., Prodr. 16[1] (1869) 344 (*rhyncholepsis*), Philip. Journ. Sci. 5 (1910) Bot. 423, 11 (1916) Bot. 209, Candollea 1 (1923) 212; F.-Vill., Novis. App. (1880) 176; Vidal, Phan. Cuming. Philip. (1885) 138, Rev. Pl. Vasc. Filip. (1886) 220.

Piper rhyncholepis C. DC. var. *brevicuspe* C. DC., Prodr. 16[1] (1869) 344; Philip. Journ. Sci. 5 (1910) Bot. 424.

Rhyncholepis cumingiana Miq., Syst. Pip. (1843) 282, non *Piper cumingiana* Miq., Nov. Act. Acad. Nat. Cur. 21 (1846) Suppl. 45, *t. 45*.

A diœcious vine; the branches terete, hirsute, 1.5 to 4 mm in diameter. Leaves membranaceous, lower ones chartaceous, oblong to oblong-ovate, 11 to 21.5 cm long, 4.5 to 11.5 cm wide, base cordate-auriculate, lobes sometimes overlapping, equilaterally to subequilaterally rounded, 9- to 11-nerved, apex shortly and acutely acuminate to acutely acuminate, pilose on both surfaces, margin pilose, nerves rather prominent beneath, reticulations somewhat obscure above, rather prominent beneath; petioles hirsute, 5 to 10 mm long; stipules persistent, castaneo-hirsute, oblong-ovate, acuminate, 15 to 35 mm long, 3 to 6 mm wide, ventricose-concave, subcoriaceous. Pistillate spikes oblong, 2.5 to 7.5 cm long, 0.7 to 1 cm in diameter; the peduncles hirsute, 7 to 13 mm long, rarely up to 25 mm long; rachis hirsute; bracts pedicellate, peltate, disk orbicular, 0.6 to 0.8 mm wide, apex subulate, fleshy, angled, glabrous above; styles crowded, 1 to 2 mm long; stigmas 2 or 3, recurved, hispid, 0.5 to 0.8 mm long; fruits free, crowded, base concrescent, oblong to oblong-ovoid, 1 to 2 mm long, without the styles. Staminate spikes slender, 3.5 to 4 cm long, 2 to 3 mm in diameter; the peduncles hirsute, 0.5 to 0.7 cm long; rachis hirsute; bracts pedicellate, peltate, dense, imbricate, disk oblong to orbicular, angled, glabrous above and on the margin, margin membranaceous, apex subulate, pedicel hirsute; stamens 2, pedicellate, anthers oblong, bilocular, 2-valved, filaments 2 to 4 mm long.

Samar, without definite locality, *Cuming 1697* (type collection of *Rhyncholepis cumingiana* Miq. = *Piper rhyncholepis* C. DC.), *1706;* without definite locality, *Bur. Sci. 17409 Ramos;* Yaborog, *Bur. Sci. 17563 Ramos;* Paranas, *Bur. Sci. 17595 Ramos;* Loquilocon, *Bur. Sci. 43734 McGregor.* Leyte, Tingib, *Philip. Pl. 1159 Ramos;* Dagami, Panda, *Wenzel 20, 21, 56;* Jaro, Buenavista, *Wenzel 733.* Bohol, without definite locality, *Cuming 1843* (type collection of *Rhyncholepis brevicuspis* Miq.); Valencia, *Bur. Sci. 42824 Ramos;* Calingohan, *Bur. Sci. 43377 Ramos.* Mindanao, Surigao Province, Surigao, *Bur. Sci. 34455, 34532, 34804, 34815 Ramos and Pascasio;* Placer, *Wenzel 2871:* Agusan Province, Cabadbaran, Mount Urdaneta, *Elmer*

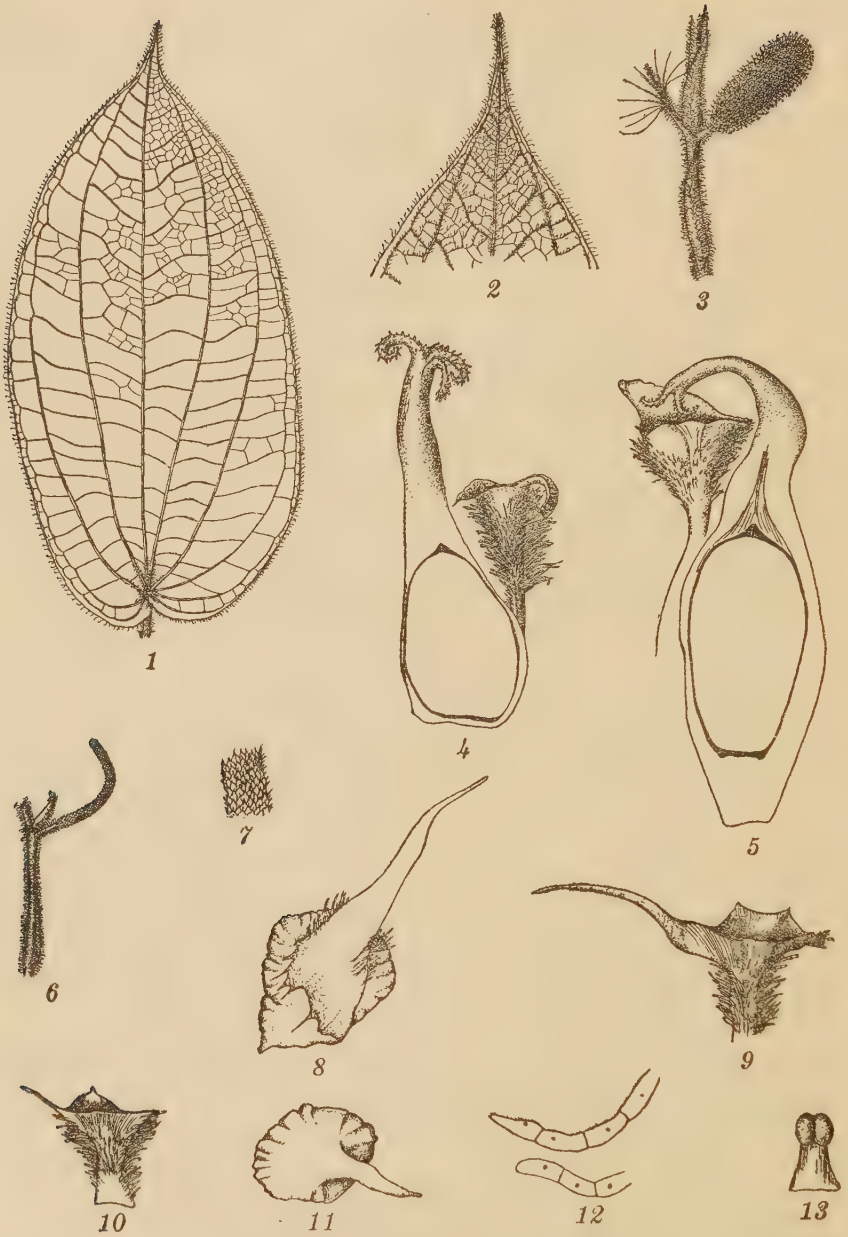

FIG. 5. *Piper brevicuspe* (Miq.) Merr.; *1*, leaf, × 0.5; *2*, apex of a leaf, × 0.5; *3*, mature pistillate spike and stipules, × 0.5; *4*, longitudinal section of a fruit, a bract and three stigmas, × 10; *5*, same with two stigmas, × 10; *6*, staminate spike, × 0.5; *7*, detail of a portion of 6 showing arrangement of bracts, about × 2; *8*, lower view of disk of ♀ bract, × 10; *9*, side view of disk of ♀ bract, × 10; *10*, side view of disk of ♂ bract, × 10; *11*, lower view of ♂ bract, × 10; *12*, hairs on bracts, much enlarged; *13*, stamen, × 10.

13410: Davao Province, Mount Mayo, *Bur. Sci. 49457, 49464 Ramos and Edaño.* In damp forests at low and medium altitudes. Endemic.

Local names: Talon-talón (Sub.); tonyabayán (Mbo.).

This species is distinguished from the rest of the Philippine pipers belonging to the auriculate group by its conspicuously nerved lamina. It is further characterized by its very unique bracts, the apex of the disk being subulate, the conspicuously pubescent surfaces of the lamina, and the long styles.

6. PIPER MEDINILLIFOLIUM sp. nov. Text fig. 6; Plate 2.

Frutex dioicus, scandens; ramulis dense villosis; foliis subchartaceis, oblongo-lanceolatis, 10 ad 14 cm longis, 2.3 ad 4.5 cm latis, basi aequiteralibus ad subaequilateralibus rotundatis, 7-plinerviis, apice acute acuminatis ad sat longe acute acuminatis, utrinque marginibusque hirsutis; spicis ♀ erectis, elon-

FIG. 6. *Piper medinillifolium* sp. nov.; *1*, leaf, × 0.5; *2*, top and side views of pistillate bracts, × 10; *3*, fruits and pistillate bract, × 7.5.

gatis, gracilis, 5 ad 5.5 cm longis, 3.5 ad 4.5 mm diametro; bracteis pedicellatis, peltatis, 1 ad 15 mm longis, peltis orbicularis, supra marginibusque glabris; baccis liberis, sessilibus, confertis, oblongo-subobovoideis, 1.75 ad 2 mm longis, 1 mm diametro; stigmatibus 3, ovoideis.

A diœcious vine; the branches densely villose, terete, minutely canaliculate, pale brown, 1.25 to 2.5 mm in diameter. Leaves subchartaceous, oblong-lanceolate, 10 to 14 cm long, 2.3 to 4.5 cm wide, base equilaterally to subequilaterally rounded, 7-plinerved, apex acutely acuminate to long and acutely acuminate, hirsute on both surfaces, margin prominently hirsute, reticulations more or less obscure above, prominent beneath; petioles short, densely villose, 3 to 5 mm long. Pistillate spikes elongated, cylindric, slender, erect, 5 to 5.5 cm long, 3.5 to 4.5 mm in diameter; the peduncles villose, very much longer than the petioles, 3.3 to 5 cm long; rachis hirsute; bracts long-pedicellate, peltate, 1 to 1.5 mm long, disk orbicular, about 0.75 mm wide,

glabrous above and on the margin, membranaceous, pedicels hirsute; fruits free, crowded, sessile, oblong-subobovoid, angled, 1.75 to 2 mm long, about 1 mm in diameter; stigmas 3, minute, ovoid, obtuse, sessile, apical.

LEYTE, Burauen, *Bur. Sci. 15364 Ramos* (type in herb. Manila), August 12, 1912, in the mossy forest; Jaro, Buenavista, *Wenzel 773, 893,* in forests, altitude about 500 meters.

A species manifestly belonging in the group with *Piper arborescens* Roxb. suggesting at first glance the Amboina species *Piper gelalae* C. DC. It is, however, by no means related to this. Its closest Philippine relative is *Piper pilipes* C. DC., from which it is distinguished by the conspicuous pubescence on the margin of the lamina, the plinerved venation of its leaves, and the comparatively shorter pistillate spikes.

7. **PIPER TOPPINGII** C. DC. Text fig. 7.

Piper toppingii C. DC. in Leafl. Philip. Bot. 3 (1910) 783, Philip. Journ. Sci. 5 (1910) Bot. 446, 11 (1916) Bot. 221, Candollea 1 (1923) 205; MERR., Enum. Philip. Fl. Pl. 2 (1923) 16.

Piper chlorocarpum C. DC. in Philip. Journ. Sci. 11 (1916) Bot. 221, Candollea 1 (1923) 241; MERR., Enum. Philip. Fl. Pl. 2 (1923) 16.

A diœcious vine; the branches villose, terete, 2 to 3 mm in diameter. Leaves chartaceous, ovate-lanceolate to elliptic-lanceolate, 9 to 18 cm long, 2 to 8 cm wide, base subequilaterally subacute to subrounded, one lobe attenuate, the other narrowly rounded, to both rounded or both rarely acute, usually with a minute auricle or lobule at the base, attached to the petiole, 7-plinerved, apex acuminate to slenderly acuminate, acumen acute to subobtuse, glabrous above, hirsute to densely hirsute beneath, the younger leaves hirsute on both surfaces, very rarely hirsute on the midrib above or glabrous beneath, reticulations somewhat obscure above, prominent beneath; petioles densely hirsute, 3 to 8 mm long, in the lower leaves up to 13 mm long. Pistillate spikes greatly elongated, cylindric and slender, 7 to 13.2 cm long, 5 to 7 mm in diameter; the peduncles hirsute, 3 to 6.8 cm long; rachis densely hirsute; bracts long-pedicellate, peltate, 1.5 to 1.75 mm long, disk orbicular, glabrous above and on the margin, 0.75 to 1 mm wide, pedicels long, densely hirsute; fruits free, crowded, sessile, globose to obovoid, 1.75 to 2 mm long, 1 to 1.5 mm in diameter, somewhat angled; stigmas 3, minute, ovoid, sessile, apical. Staminate spikes subpendulous, slender, 6 to 11.5 cm long, 1 to 2.5 mm in diameter; the peduncles hirsute, 2.5 to 4.5 cm long; rachis densely hirsute;

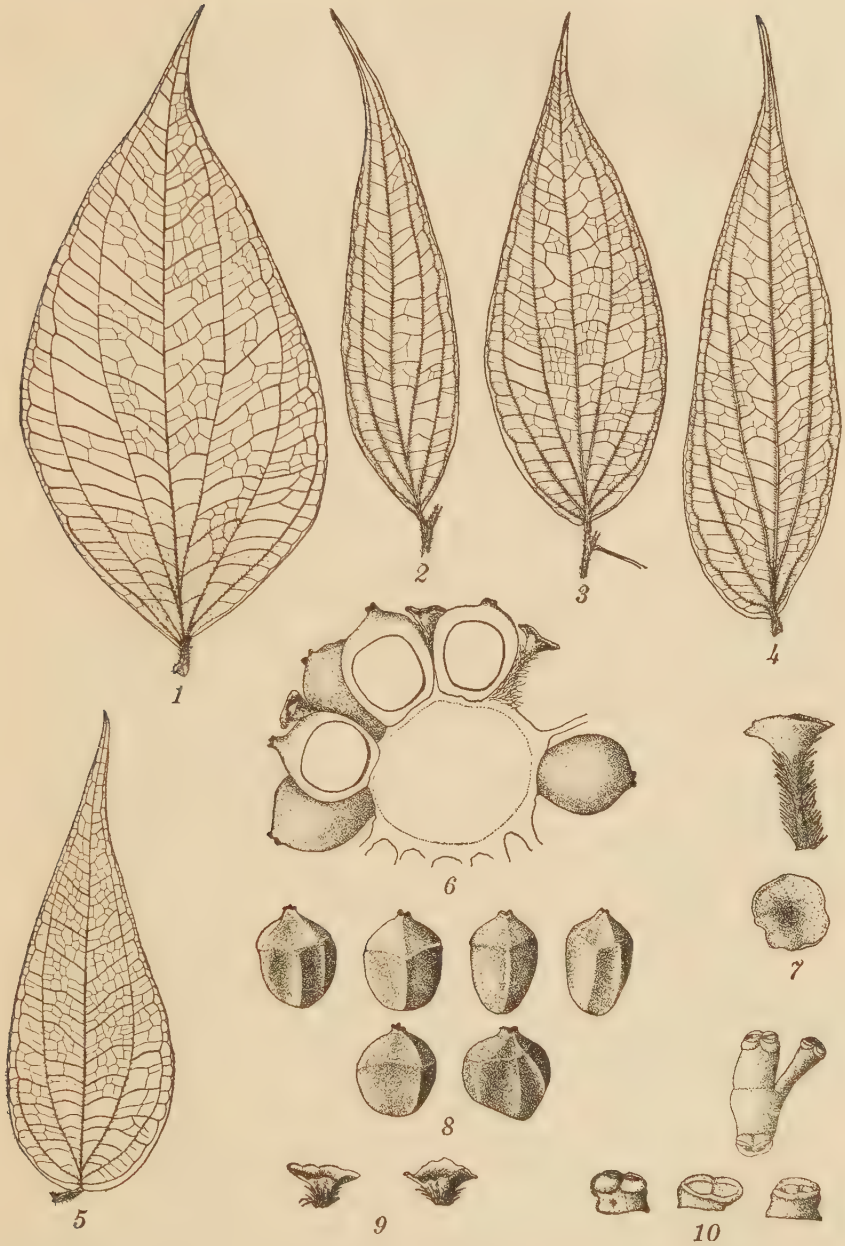

FIG. 7. *Piper toppingii* C. DC.; *1–5*, leaves, × 0.5; *6*, transverse section of mature pistillate spike, × 7.5; *7*, side and top views of pistillate bracts, × 10; *8*, fruits, × 7.5; *9*, side view of staminate bracts, × 10; *10*, stamens, × 10.

bracts somewhat pedicellate, peltate, 0.5 to 0.75 mm long, disk orbicular, glabrous above and on the margin, about 0.75 mm wide, pedicels densely hirsute, very slender; stamens 2 or 3, two lateral and one posterior, the latter usually smaller, somewhat pedicellate, 0.5 to 0.75 mm long, anthers oblong-ellipsoid bilocular, 2-valved, filaments oblong, stout, longer than the anthers.

LUZON, Ilocos Norte Province, Bangui to Claveria, *Bur. Sci. 33116 Ramos;* Mount Palimlim, *Bur. Sci. 33359 Ramos:* Bontoc Subprovince, without definite locality, *Vanoverbergh 691a;* Mount Puquis, *Bur. Sci. 37790 Ramos and Edaño;* Mount Polis, *Bur. Sci. 37650 Ramos and Edaño;* Mount Masapilid, *Bur. Sci. 37902 Ramos and Edaño:* Ifugao Subprovince, Mount Polis, *Bur. Sci. 19818 McGregor:* Benguet Subprovince, Mount Tonglon, *Merril 7770;* Baguio, *Elmer 8375* (type collection of *Piper toppingii* C. DC.), *5850, Williams 1091, For. Bur. 5081 Curran, Bur. Sci. 5555 Ramos, 14114 Robinson, Topping 14;* Mount Pulog, *Merrill 6530:* Nueva Viscaya Province, Compote, *Bur. Sci. 20129 McGregor:* Rizal Province, San Isidro, *Philip. Pl. 274 Ramos;* Mount Lumutan, *Bur. Sci. 29605, 29725, s. n. Ramos and Edaño;* Mount Susong-dalaga, *Bur. Sci. 29373 Ramos and Edaño:* Laguna Province, San Antonio, *Bur. Sci. 16638* (type collection of *Piper chlorocarpum* C. DC.) *20507 Ramos;* Mount San Cristobal, *Juliano 1080;* Mount Maquiling, *Baker 3499.* MINDORO, Mount Calavite, *Bur. Sci. 39396, 39473 Ramos:* Puluan, *Bur. Sci. 93787 Ramos.* In forests at medium and high altitudes, ascending to 2,100 meters. Endemic.

Local names: Duút (Ig.); litlít-matsing (Tag.).

A species clearly belonging in the group with *Piper arborescens* Roxb., being most closely allied to *Piper pilipes* C. DC., but differing essentially in its plinerved venation, ovate-lanceolate to elliptic-lanceolate leaves, and its relatively shorter pistillate spikes and bracts.

8. **PIPER URDANETANUM** C. DC. Text fig. 8.

Piper urdanetanum C. DC. in Leafl. Philip. Bot. 6 (1914) 2293, Candollea 1 (1923) 198; MERR., Enum. Philip. Fl. Pl. 2 (1923) 16.

Piper wenzelii C. DC. in Philip. Journ. Sci. 11 (1916) Bot. 213, Candollea 1 (1923) 198; MERR., Enum. Philip. Fl. Pl. 2 (1923) 17.

Piper hirtirache C. DC. in Philip. Journ. Sci. 11 (1916) Bot. 213, Candollea 1 (1923) 252; MERR., Enum. Philip. Fl. Pl. 2 (1923) 17.

A dicœcious vine; the branches glabrous, subterete, pale brown, canaliculate, 2.5 to 4 mm in diameter. Leaves chartaceous to subcoriaceous, elliptic-lanceolate to elliptic-ovate-lan-

FIG. 8. *Piper urdanetanum* C. DC.; *1–3*, leaves, × 0.5; *3a*, mature pistillate spike, × 0.5; *4*, transverse section of mature pistillate spike, × 7.5; *5*, side view of pistillate bracts, × 10; *6*, fruits, × 7.5; *7*, top and side views of staminate bracts, × 10; *8*, stamens, *a*, before dehiscence, *b*, after dehiscence, × 10.

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ceolate, 11 to 23 cm long, 3.5 to 9.3 cm wide, base equilaterally acute, 7-plinerved, apex acutely acuminate to long and acutely acuminate, glabrous on both surfaces, reticulations somewhat prominent on both surfaces; petioles glabrous, 10 to 20 mm long. Pistillate spikes greatly elongated, cylindric and slender, 7 to 21.5 cm long, 4 to 7 mm in diameter; the peduncles glabrous, 1.7 to 3.3 cm long; rachis densely hirsute; bracts long-pedicellate, peltate, 1.5 to 2 mm long, disk orbicular, glabrous, 0.5 to 0.75 mm wide, pedicels long, densely hirsute; fruits free, sessile, crowded, glabrous, oblong to oblong-subobovoid, 1.75 to 2 mm long, 0.8 to 1.25 mm in diameter; stigmas 3, rarely 4, short, ovoid, acute, sessile, apical. Staminate spikes 6 to 11.5 cm long, 1.75 to 2 mm in diameter; the peduncles glabrous, 10 to 20 mm long; rachis densely hirsute; bracts pedicellate, peltate, subimbricate, 0.5 to 0.6 mm long, disk orbicular, glabrous, subfleshy, 0.75 to 0.8 mm wide, pedicels stout, densely hirsute; stamens 2, somewhat pedicellate, 0.3 to 0.5 mm long, anthers ovoid to globose-ovoid, bilocular, 2-valved, filaments very slender, shorter than the anthers.

SAMAR, Ambalate, *Bur. Sci. 17587 Ramos;* Catubig River, *Bur. Sci. 24165, 24285 Ramos.* LEYTE, Jaro, Buenavista, *Wenzel 628* (type collection of *Piper wenzelii* C. DC.), *723, 779, 819, 891, 1197, 1168* (type collection of *Piper hirtirache* C. DC.). MINDANAO, Agusan Province, Cabadbaran, Mount Urdaneta, *Elmer 13713* (type collection of *Piper urdanetanum* C. DC.). In forests at low and medium altitudes, ascending to 500 meters. Endemic.

Local name: Sauodan (Mbo.).

A species belonging in the group with *Piper arborescens* Roxb., but by its slender pistillate spikes being nearer to *Piper toppingii* C. DC. It differs from the latter in the absence of small auricles or lobules at the base of the lamina, and its glabrous leaves, branches, and peduncles.

9. PIPER SIMILE sp. nov. Text fig. 9; Plates 3 and 4.

Frutex dioicus, scandens; ramulis glabris; foliis chartaceis ad subcoriaceis, elliptico-lanceolatis, 7.5 ad 11.8 cm longis, 1.7 ad 3.3 cm latis, basi aequilateralibus acutis, 5-plinerviis, apice attenuate acutis, utrinque glabris; spicis ♀ gracilis, 4 ad 4.5 cm longis, 4.5 ad 5 mm diametro; bracteis pedicellatis, peltatis, peltis orbicularis, supra marginibusque glabris, crenulatis, leviter depressis; baccis liberis, confertis, sessilibus, oblongo-obovoideis ad obovoideis, 1.5 ad 1.75 mm longis, 1 ad 1.25 mm diametro;

stigmatibus 3 vel 4, rotundato-ovoideis, sessilibus; staminibus 2, subsessilibus, antheris reniformibus, 2-valvatis, bracteis sessilibus.

FIG. 9. *Piper simile* sp. nov.; *1*, habit, male plant, × 0.5; *2*, portion of the transverse section of a mature pistillate spike, × 7.5; *3*, fruits, × 7.5; *4*, side and top views of pistillate bracts, × 10; *5*, habit, female plant, × 0.5; *6*, leaf, × 0.5; *7*, top and side views of staminate bracts, × 10; *8*, stamens, × 10.

A dicœcious vine; the branches glabrous, subterete, 1.75 to 4 mm in diameter. Leaves chartaceous to subcoriaceous, elliptic-lanceolate, 7.5 to 11.8 cm long, 1.7 to 3.3 cm wide, base equilaterally acute, 5-plinerved, apex acutely attenuate, entirely glabrous on both surfaces, reticulations somewhat obscure on both surfaces; petioles glabrous, 6 to 12 mm long, in the lower leaves up to 25 mm long. Pistillate spikes cylindric, slender, 4.5 to 5 cm long, 4.5 to 5 mm in diameter; the peduncles glabrous, 7 to 8 mm long; rachis densely hirsute; bracts pedicellate, peltate, about 1 mm long, disk orbicular, 0.6 to 0.75 mm wide, glabrous, membranaceous, crenulate, somewhat depressed, pedicels densely hirsute; fruits free, sessile, somewhat crowded, oblong-obovoid to obovoid, glabrous, 1.5 to 1.75 mm long, 1 to 1.25 mm in diameter; stigmas 3 or 4, short, rounded-ovoid, sessile, apical. Staminate spikes long and pendulous, slender, 9.5 to 14 cm long, 2 to 2.5 mm in diameter; the peduncles glabrous, 7 to 10 mm long; rachis densely hirsute; bracts sessile, peltate, disk orbicular, 0.6 to 0.75 mm wide, glabrous, membranaceous; stamens 2, subsessile, 0.25 to 0.3 mm long, anthers reniform, 2-valved.

LUZON, Ilocos Norte Province, Bangui to Claveria, *Bur. Sci. 33105 Ramos* (type in herb. Manila), August 11, 1918, at an altitude of about 500 meters: Tayabas Province, Mount Alzapan, *Bur. Sci. 45702 Ramos and Edaño,* June 6, 1925, on forested slopes, altitude about 1,900 meters.

A species closely allied to *Piper urdanetanum* C. DC., in vegetative characters approaching *Piper elliptibaccum* C. DC., but with pistillate spikes clearly approaching *Piper urdanetanum* C. DC., but differing from both species in many respects. It is distinguished from *Piper elliptibaccum* C. DC. by its slender pistillate spikes and from *Piper urdanetanum* C. DC. by the size and form of its leaves, its relatively shorter pistillate spikes, sessile staminate bracts, and subsessile stamens.

10. PIPER LESSERTIANUM (Miq.) C. DC. Text fig. 10.

Piper lessertianum (Miq.) C. DC., Journ. Bot. 4 (1866) 164;[5] MERR., Enum. Philip. Fl. Pl. 2 (1923) 10.

Chavica lessertiana MIQ., Syst. Pip. (1843) 270, Fl. Ind. Bat. 1[2] (1858–59) 445.

Piper pseudochavica C. DC., Prodr. 16[1] (1869) 351, Leafl. Philip. Bot. 3 (1910) 769, Philip. Journ. Sci. 5 (1910) Bot. 427, 11 (1916) Bot. 212, Candollea 1 (1923) 201; F.-VILL., Novis. App. (1880) 175; VIDAL, Phan. Cuming. Philip. (1885) 138, Rev. Pl. Vasc. Filip. (1886) 219.

[5] Non C. DC. Prodr. 16[1] (1869) 258, Candollea 1 (1923) 152.

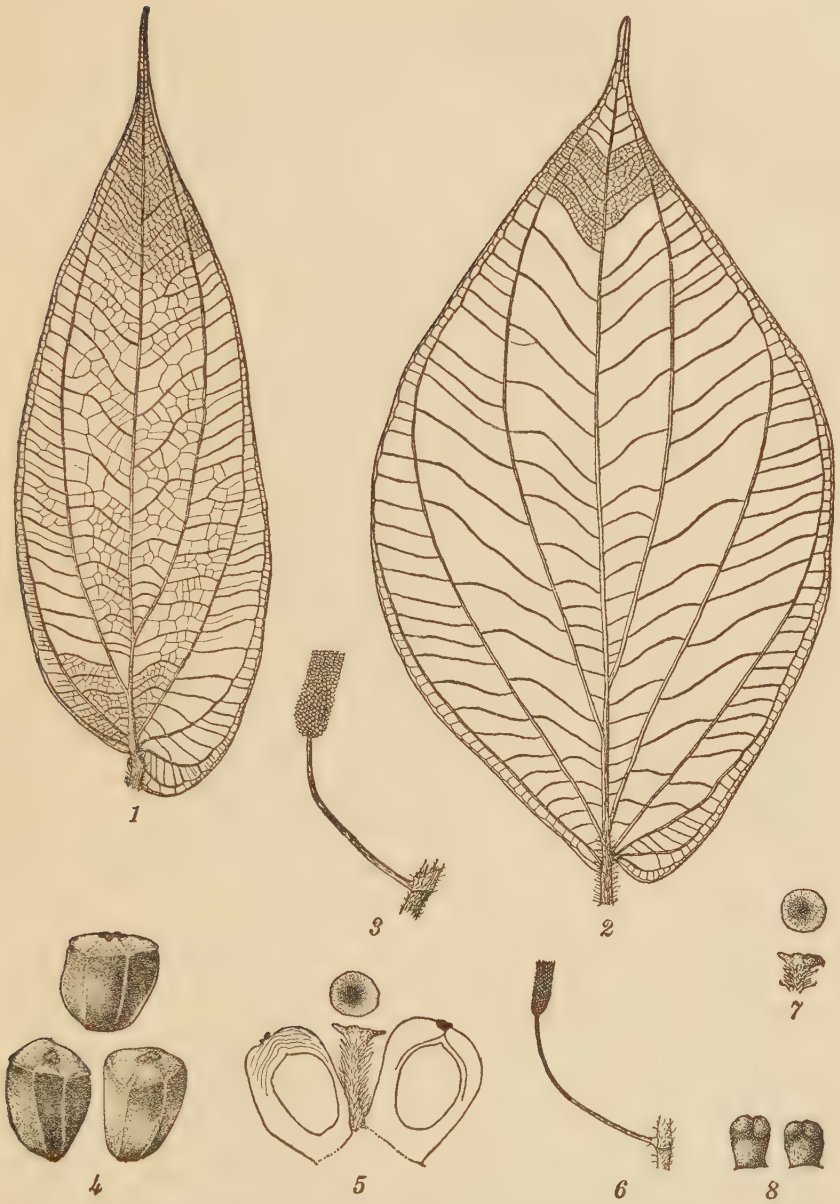

FIG. 10. *Piper lessertianum* (Miq.) C. DC.; *1–2*, leaves, × 0.5; *3*, portion of pistillate spike, × 0.5; *4*, fruits, × 7.5; *5*, longitudinal section of fruits and ♀ bracts, × 7.5; *6*, portion of staminate spike, × 0.5; *7*, top and side views of staminate bracts, × 7.5; *8*, stamens, × 10.

A dicœcious vine; the branches glabrous to villose, terete, 2 to 6 mm in diameter. Leaves chartaceous to subcoriaceous, broadly ovate-elliptic, oblong-elliptic or elliptic lanceolate, 12.5 to

32 cm long, 5.5 to 16.5 cm wide, base inequilaterally rounded, one lobe acute to narrowly rounded, the other auriculate, 7- to 9-plinerved, apex usually long and acutely acuminate, sometimes acutely acuminate, glabrous above, sparsely hirsute to villose on the nerves beneath, very rarely glabrous, reticulations somewhat obscure above, prominent beneath; petioles glabrous to villose, 2 to 6 mm long. Pistillate spikes elongated, cylindric and slender, 2.5 to 6 cm long, 5 to 10 mm in diameter; the peduncles 3 to 8 cm long, glabrous; rachis hirsute; bracts long-pedicellate, peltate, 2 to 2.2 mm long, disk suborbicular to orbicular, glabrous, 0.6 to 0.8 mm wide, pedicel hirsute; fruits free, crowded, oblong to oblong-ovoid, 1.8 to 2.3 mm. long, 1 to 1.5 mm. in diameter, angled; stigmas 3, rounded, sessile, apical; seeds oblong to oblong-ovoid, adhering to the pericarp, 1.5 to 2 mm long. Staminate spikes 2.5 to 4.5 cm long, 2 to 4 mm in diameter; the peduncles glabrous to sometimes sparsely hirsute, 3 to 6.5 cm long; rachis hirsute; bracts pedicellate, peltate, 0.5 to 0.75 mm long, disk imbricate, orbicular, glabrous, about 0.75 mm wide, pedicel hirsute; stamens 2, subsessile, 0.5 to 1 mm long, anthers oblong, tetralocular, 2-valved.

LUZON, Cagayan Province, without definite locality, *Cuming 1343* (type collection of *Chavica lessertiana* Miq.) : Apayao Subprovince, Guiniri, *Bur. Sci. 28226 Fénix:* Kalinga Subprovince, Mount Masingit, *Bur. Sci. 37606 Ramos and Edaño:* Bontoc Subprovince, Pininggat, *Vanoverbergh 691:* Ifugao Subprovince, Mount Polis, *Bur. Sci. 19823 McGregor:* Rizal Province, Montalban, *Loher 12941:* Tayabas Province, Mount Binuang, *Bur. Sci. 28688 Ramos and Edaño;* Mount Banahao, *Bur. Sci. 47415 McGregor;* Casiguran, *Bur. Sci. 45351 Ramos and Edaño.* ALABAT, *Bur. Sci. 48053, 48062, Ramos and Edaño.* MINDORO, without definite locality, *For Bur. 11411 Merritt;* Mount Calavite, *Bur. Sci. 39417, 39432 Ramos;* Mount Halcon, *Bur. Sci. 40639, 40676 Ramos and Edaño.* PANAY, Capiz Province, Mount Macosolon, *Bur. Sci 30776 Ramos and Edaño;* Jamindan, *Bur. Sci. 30834, 30861, 30916, 31263, 31272 31372 Ramos and Edaño;* Mount Salibongbong, *Bur. Sci. 35514 Martelino and Edaño;* Mount Kinablangan, *Bur. Sci. 46051, 46176 Edaño.* MINDANAO, Lanao Province, Lake Lanao, Camp Keithley, *Clemens 574;* Saguin-saguing, *For. Bur. 23384 Acuña:* Zamboanga Province, Malangas, *Bur. Sci. 36976 Ramos and Edaño.* BUCAS GRANDE, *Bur. Sci. 35118 Ramos and Pascasio.* In damp forests at medium altitudes. Endemic.

Local names: Amomoslo (Mang.); manikatápai (Bag.).

The alliance of this species is with *Piper toppingii* C. DC., from which it differs in its auriculate leaves, shorter staminate spikes, and other characters.

Var. OBLONGIBACCUM (C. DC.) comb. nov. Text fig. 11.

Piper oblongibaccum C. DC. in Leafl. Philip. Bot. 3 (1910) 777, Philip. Journ. Sci. 5 (1910) Bot. 441, Candollea 1 (1923) 176; MERR., Enum. Philip. Fl. Pl. 2 (1923) 12.

Piper pseudochavica C. DC. var. *angustilimbum* C. DC. in Candollea 1 (1923) 201.

Lamina narrowly elliptic-lanceolate, 2.5 to 6 cm wide, peduncles usually shorter than in the species.

LUZON, Tayabas Province, Mount Binuang, *Bur. Sci. 28507 Ramos and Edaño:* Sorsogon Province, Irosin, Mount Bulusan,

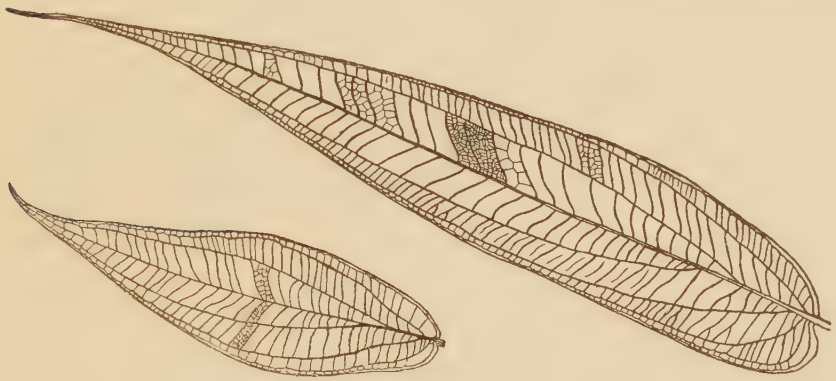

FIG. 11. *Piper lessertianum* (Miq.) C. DC. var. *oblongibaccum* (C. DC.) comb. nov.; leaves, × 0.5.

Elmer 16317. MINDORO, Mount Calavite, *Bur. Sci. 39443bis Ramos.* SAMAR, Las Navas, Catubig River, *Bur. Sci. 24527 Ramos.* PANAY, Capiz Province, Mount Macosolon, *Bur. Sci. 30787 Ramos and Edaño;* Libacao, *Bur. Sci. 35395, 35442 Martelino and Edaño.* NEGROS, Occidental Negros Province, Mount Canlaon, *For. Bur. 13679 Curran:* Oriental Negros Province, Dumaguete, Cuernos Mountains, *Elmer 9456* (type collection of *Piper oblongibaccum* C. DC.). MINDANAO, Bukidnon Province, Mahilucot River, *Bur. Sci. 38688 Ramos and Edaño:* Davao Province, Mount Apo, *Copeland 1140, Elmer 11417.* In damp forests at medium altitudes. Endemic.

Local names: Buyok-buyok (C. Bis.); tugpoai (Buk.).

This variety differs from the species in its narrowly elliptic-lanceolate leaves.

11. PIPER SUBPROSTRATUM C. DC. Text figs. 12 and 13.

Piper subprostratum C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 425, Candollea 1 (1923) 202; MERR., Enum. Philip. Fl. Pl. 2 (1923) 15.

A diœcious subprostrate shrub, 1 to 1.5 m high; the branches puberulent, angled, canaliculate, 5 to 10 mm in diameter. Leaves membranaceous, large, oblong-ovate to broadly ovate-elliptic, 18

FIG. 12. *Piper subprostratum* C. DC.; typical leaves, × 0.5.

to 23 cm long, 10 to 13 cm wide in the male, 24 to 26 cm long and 15.5 to 16.5 cm wide in the female, base inequilaterally cordate, one lobe subrounded, the other auriculate, 11- to 13-plinerved, apex acutely attenuate to short and acutely acuminate, glabrous above, puberulent on the nerves beneath, reticulations somewhat prominent on both surfaces; petioles puberulent, 1.5 to 3.5 cm long. Pistillate spikes erect, cylindric, slender, 4 to 4.5 cm long, 6 to 7 mm in diameter; the peduncles puberulent, about 3.5 cm long; rachis slightly pilose; bracts long-pedicellate, peltate, disk suborbicular, about 1 mm wide, lobed, glabrous, pedicel 2 to 2.3 mm long, pilose; fruits free, not crowded, partly embedded in and concrescent with the rachis, glabrous, elliptic-obovoid, about 3 mm long, 1.5 to 1.8 mm in diameter; styles sessile; stigmas 3, sessile, apical, papillate; seeds oblong, adhering

FIG. 13. *Piper subsprostratum* C. DC.; *1*, top and side views of pistillate bracts, × 7.5; *2*, fruit, × 7.5; *3*, longitudinal section of a fruit, × 7.5; *4*, top and side views of staminate bracts, × 7.5; *5*, stamens, × 7.5.

to the pericarp, about 2 mm long. Staminate spikes erect, 7.5 to 11.5 cm long, 4 to 5 mm in diameter; the peduncles puberulent, 3 to 3.5 cm long; rachis hirsute; bracts pedicellate, peltate, about 1 mm long, disk orbicular, glabrous, 1 to 1.5 mm wide, pedicel hirsute; stamens 2, about 0.8 mm long, anthers subglobose, bilocular, 2-valved, filaments shorter than the anthers.

LUZON, Rizal Province, Mount Lumutan, *Bur. Sci. 42222 Ramos.* MINDORO, south of Lake Naujan, *For. Bur. 6751 Merritt* (type collection); Mount Halcon, *Bur. Sci. 40719, 40720, 40726, Ramos and Edaño.* In forests at low and medium altitudes. Endemic.

This species is allied to *Piper lessertianum* (Miq.) C. DC.; it differs in its habit, in the nature of the pubescence on the vegetative parts, in its fruits being partly embedded in the rachis, and in its subglobose anthers.

12. PIPER DECUMANUM Linn. Text fig. 14.

Piper decumanum LINN. in Stickman Herb. Amb. (1754) 19, Amoen. Acad. 4 (1759) 128, Sp. Pl. ed. 2 (1762) 41; MERR., Interpret. Herb. Amb. (1917) 181, Enum. Philip. Fl. Pl. 2 (1923) 7; C. DC., Candollea 1 (1923) 230.

Sirium decumanum RUMPH., Herb. Amb. 5: 45, *t. 27.*

Piper forstenii C. DC., Prodr. 16[1] (1869) 348, Leafl. Philip. Bot. 3 (1910) 768, Philip. Journ. Sci. 5 (1910) Bot. 424, Candollea 1 (1923) 190.

A diœcious vine; the branches glabrous, terete, rigid, pale when dry, 6 to 12 mm in diameter. Leaves subcoriaceous to coriaceous, broadly oblong-ovate to broadly ovate, 28 to 43 cm long, 11 to 25 cm wide, base inequilaterally cordate-auriculate, lobes rounded, 13- to 15-plinerved, apex acute to shortly and acutely acuminate, glabrous and shining on both surfaces, reticulations prominent on both surfaces; petioles glabrous, 4 to 7 cm long; stipules 3.5 to 4 cm long, with dark-red glandular dots. Pistillate spikes pendulous, greatly elongated, cylindric and slender, 25 to 30 cm long, 8 to 10 mm in diameter; the peduncles glabrous, 4.5 to 6 cm long; rachis hirsute; bracts long-pedicellate, peltate, 2.5 to 3 mm long, disk concave, suborbicular, 0.8 to 1 mm wide, glabrous, pedicel hirsute; fruits crowded, free, oblong-obovoid, 2.3 to 2.5 mm long, about 1.5 mm in diameter, when young angled, becoming terete when mature, reddish brown; stigmas fleshy, trilobed; seeds oblong-ovoid. Staminate spikes greatly elongated, slender, pendulous, 24.5 to 38 cm long, 4 to 5 mm in diameter; the peduncles 2.5 to 3.5 cm long, glabrous; rachis hirsute; bracts long-pedicellate, peltate, 1.2 to 1.5 mm long, disk rounded, glabrous, about 1 mm wide, pedicel hirsute, fleshy; stamens 2, pedicellate, about 1 mm long, anthers subglobose to globose, bilocular, 2-valved, filaments longer than the anthers.

LEYTE, Mount Cabalian, *Bur. Sci. 41513 Ramos.* MINDANAO, Lanao Province, Lake Lanao, Camp Keithley, *Clemens s. n., 572:* Bukidnon Province, Sumilao, *Bur. Sci. 15667 Fénix:* Agusan Province, Cabadbaran, Mount Urdaneta, *Elmer 13296.* In forests at medium altitudes. Moluccas.

Local names: Barágit (Bag.); búyog (Mbo.); malapágba (Buk.).

This species is distinguished from all the species belonging to the auriculate group by its exceedingly long spikes and large leaves. Elmer's field note records the fact that the leaf attains a length of 90 centimeters.

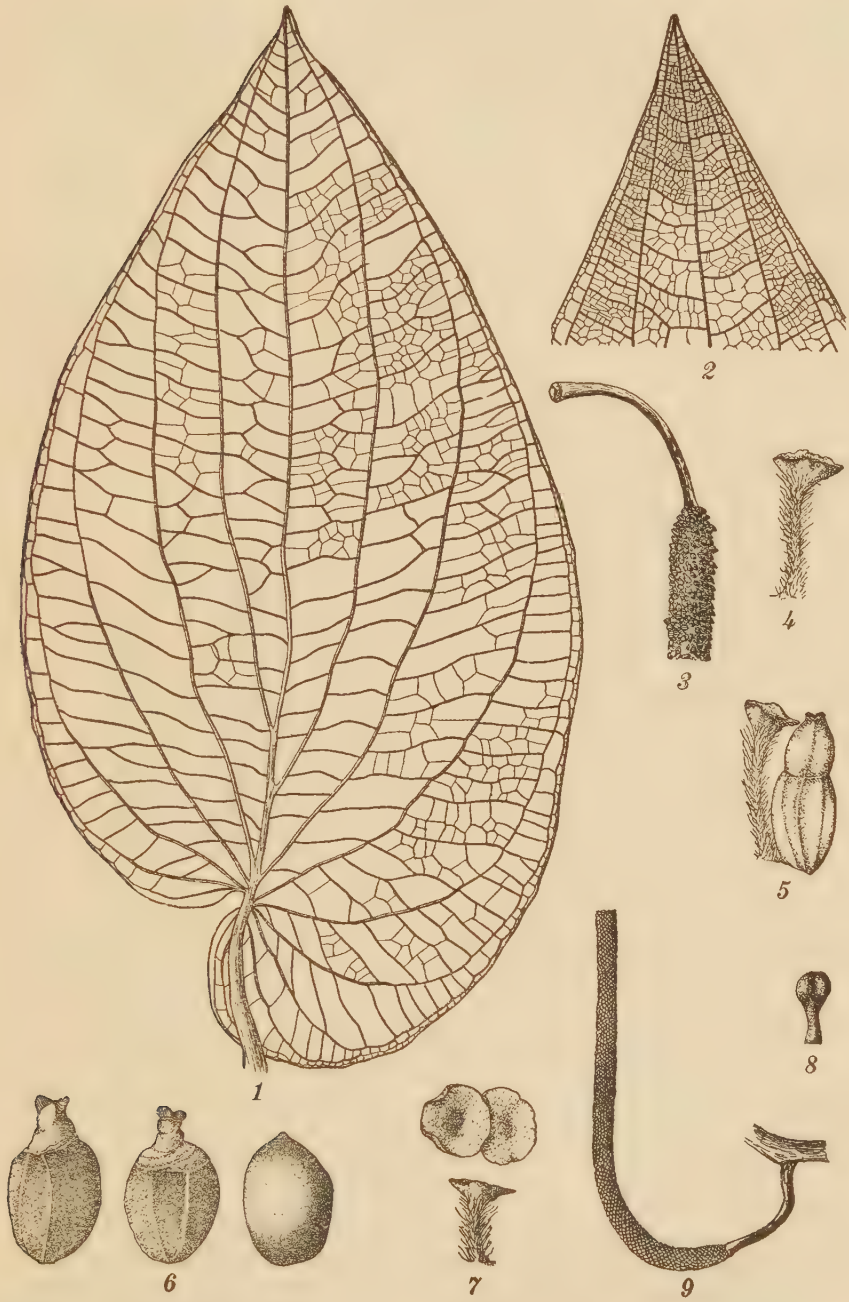

FIG. 14. *Piper decumanum* Linn.; *1*, leaf, × 0.5; *2*, tip of a leaf, × 0.5; *3*, portion of the pistillate spike, × 0.5; *4*, pistillate bract, × 7.5; *5*, young fruit and bract, × 7.5; *6*, fruits and seed, × 7.5; *7*, top and side views of staminate bracts, × 7.5; *8*, stamen, × 7.5; *9*, portion of staminate spike, × 0.5.

13. PIPER LAGENIOVARIUM C. DC. Text fig. 15.

Piper lageniovarium C. DC. in Leafl. Philip. Bot. 3 (1910) 767, Philip. Journ. Sci. 5 (1910) Bot. 424, Candollea 1 (1923) 201; MERR., Enum. Philip. Fl. Pl. 2 (1923) 10.

Erect, suffrutescent, 3 to 5 m high; stem glabrous, terete, 7.5 to 13 cm in diameter; branches sparsely hirsute, the ultimate ones densely hirsute, 3 to 6 mm in diameter. Leaves membra-

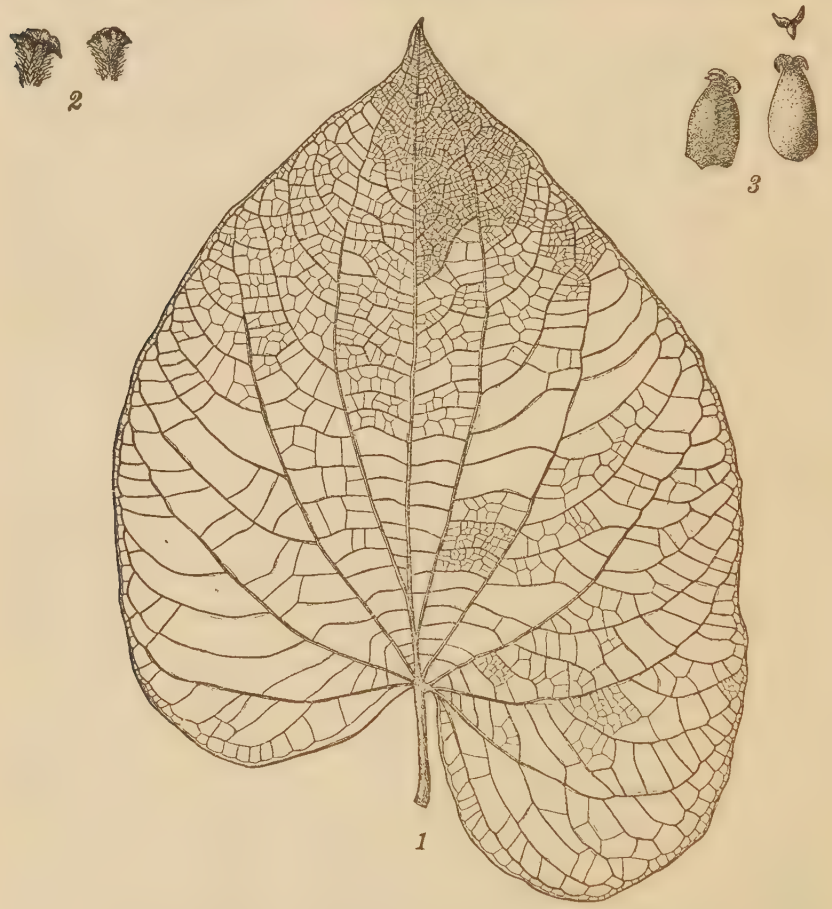

FIG. 15. *Piper lageniovarium* C. DC.; *1*, leaf, × 0.5; *2*, pistillate bracts, × 7.5; *3*, ovaries and stigmas, × 7.5.

naceous to chartaceous, broadly ovate, 21.5 to 28.5 cm long, 15.5 to 19.5 cm wide, base inequilateral, broadly and deeply cordate, lobes rounded, sinuses up to 6.5 cm deep, 10-plinerved, apex shortly and acutely acuminate, glabrous above, minutely puberulent on the nerves beneath, reticulations prominent on both surfaces; petioles sparsely hirsute, 3 to 4.5 cm long; sti-

pules lanceolate, long and acutely acuminate, 7 to 10 cm long, glabrous, tubercular, black. Pistillate spikes pendulous, greatly elongated and slender, 19.5 to 22 cm long, 5 to 8 mm in diameter; the peduncles sparsely hirsute, 10 to 15 mm long; rachis villose; bracts pedicellate, peltate, 0.8 to 1 mm long, disk suborbicular, 0.5 to 0.8 mm wide, glabrous, fleshy, margin crenulate, somewhat compressed, pedicel villose; pistil 1.8 to 2 mm long, ovary free, glabrous, lageniform, sessile, style sessile, stigmas 3, sessile, apical, ovoid, acute, reflexed, glabrous.

MINDANAO Davao Province, Todaya, Mount Apo, *Elmer 10589* (type collection) : Bukidnon Province, Kalasuñgay, *Wester 129*. In thickets and forests at medium altitudes. Endemic.

Local names: Kúyo (Bag.) ; pogápong (Buk.).

This species is closely allied to *Piper pergrande* C. DC. (*Piper grande* Ridley), of New Guinea, but has pubescent leaves, branches, petioles, and peduncles. Furthermore, the spikes of *Piper lageniovarium* C. DC. are pistillate. I find on examination of an isotype of *Piper pergrande* C. DC. (C. Boden Kloss, Camp I, Nov.-Dec., 1912) that the original description must be amended to read hermaphroditic instead of pistillate spikes.

14. PIPER MAJUSCULUM Blume. Text fig. 16.

Piper majusculum BLUME in Verh. Bat. Genoots. 11 (1826) 210, *f. 25;* C. DC., Prodr. 16[1] (1869) 350, Candollea 1 (1923) 191.

Chavica majuscula MIQ., Syst. Pip. (1843) 271.

Piper rotundistigmum C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 425, 11 (1916) Bot. 209 (incl. var. *pilosius* C. DC.), Candollea 1 (1923) 201, 206; MERR., Enum. Philip. Fl. Pl. 2 (1923) 15.

Piper leyteanum C. DC. in Philip. Journ. Sci. 11 (1916) Bot. 220, Candollea 1 (1923) 206.

A dicœcious vine; stem less than 2.5 cm in diameter; the young branches pubescent, becoming glabrous in age, terete, 3 to 6 mm in diameter. Leaves chartaceous to subcoriaceous, firm when dry, large, oblong-ovate to ovate, 18.5 to 30.5 cm long, 7.5 to 16.5 cm wide, base equilaterally to inequilaterally cordate, one or both lobes auriculate, multipenninerved, apex acutely acuminate, glabrous above, usually hirsute on the nerves beneath, sometimes glabrous, reticulations somewhat obscure above, prominent beneath; petioles 1.5 to 3.5 cm long, usually hirsute, rarely glabrous; stipules lanceolate, 4.5 to 6 cm long 5 to 6 mm wide, glabrous or hirsute. Pistillate spikes greatly elongated, cylindric and slender, pendulous, 26 to 32 cm long, 6 to 8 mm in diameter; the peduncles glabrous or hirsute, 4.5 to 7 cm long; rachis glabrous to sparsely hirsute; bracts subsessile,

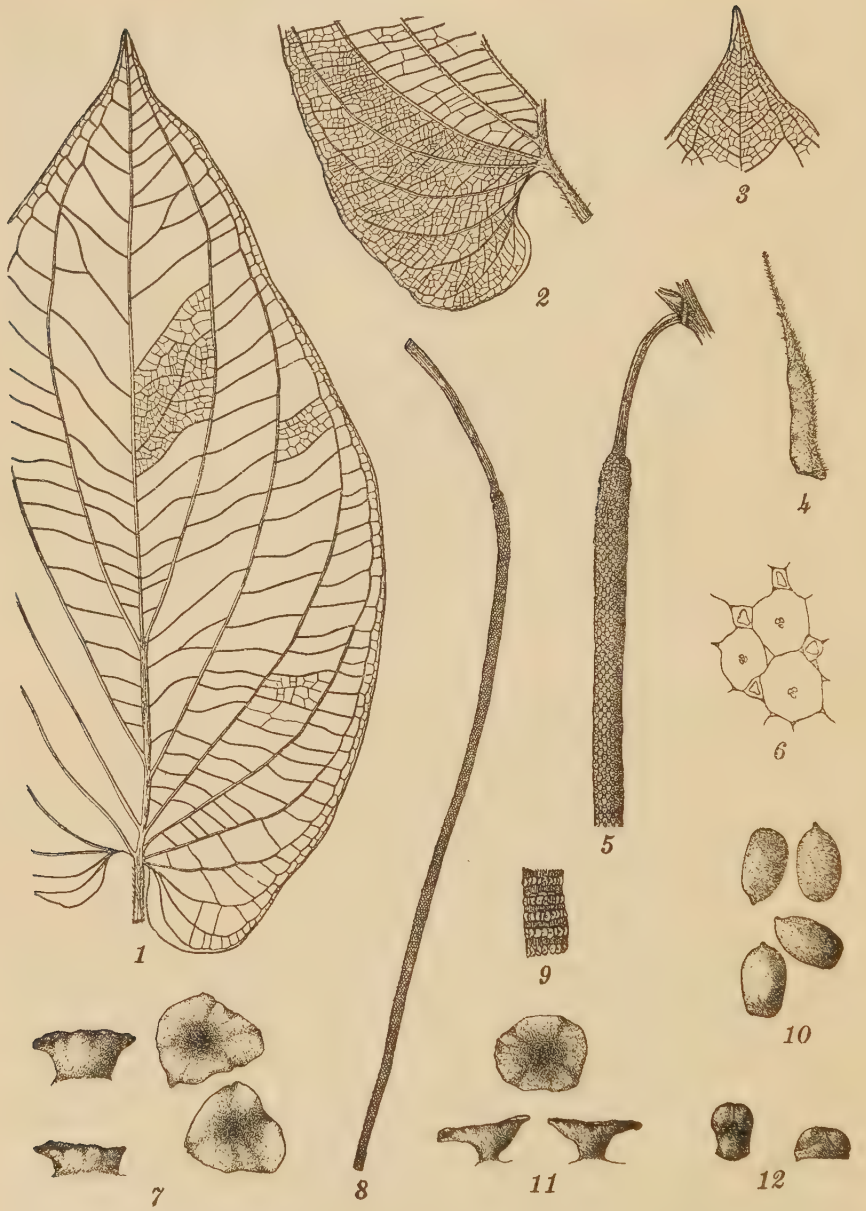

FIG. 16. *Piper majusculum* Blume; *1*, leaf with one side cut, × 0.5; *2*, lobe of the base of a leaf, × 0.5; *3*, tip of a leaf, × 0.5; *4*, stipule, × 0.5; *5*, portion of the pistillate spike, × 0.5; *6*, top view of portion of the pistillate spike, slightly enlarged; *7*, side and top views of pistillate bracts, × 7.5; *8*, staminate spike, × 0.5; *9*, portion of the staminate spike, × 1.5; *10*, seeds, × 5; *11*, top and side views of staminate bracts, × 7.5; *12*, stamens, × 7.5.

peltate, 0.2 to 0.4 mm long, disk glabrous, somewhat fleshy, suborbicular, 0.8 to 1 mm wide, pedicel short, somewhat fleshy; fruits immersed and concrescent, obovoid-obpyramid, 4- or 5-angled; seeds oblong, apex umbonate, 2 to 2.2 mm long, 0.8 to 1.2 mm in diameter; styles sessile; stigmas usually 3, rarely 4, subfleshy, rounded. Staminate spikes greatly elongated, slender, 21.5 to 43 cm long, 2 to 3 mm in diameter; the peduncles glabrous to pubescent, 2.5 to 4 cm long; rachis hirsute; bracts subsessile, peltate, disk glabrous, orbicular, 0.5 to 0.9 mm wide; stamens 2, subsessile, anthers 0.3 to 0.4 mm long, bilocular, 2-valved.

LUZON, Albay Province, without definite locality, *Vidal 3535:* Sorsogon Province, Mount Lalao, *Bur. Sci. 23405 Ramos;* Irosin, Mount Bulusan, *Elmer 14500, 15443.* SAMAR, without definite locality, *Bur. Sci. 17434 Ramos* (type collection of *Piper rotundistigmum* C. DC. var. *pilosius* C. DC.); Lauaan, *Bur. Sci. 43688 McGregor.* LEYTE, Dagami, *Bur. Sci. 15247, 15379 Ramos, Wenzel 214* (type collection of *Piper leyteanum* C. DC.) *463;* Jaro, *Wenzel 505, 657.* MINDANAO, Surigao Province, Placer, *Wenzel 1819, 2668;* Surigao, *Bur. Sci. 34537, 34547 Ramos and Pascasio:* Agusan Province, Cabadbaran, Mount Urdaneta, *Elmer 13521, 14001:* Davao Province, without definite locality, *Copeland s. n.:* Lanao Province, Lake Lanao, Camp Keithley, *Clemens s. n.* (type of *Piper rotundistigmum* C. DC. in herb. Manila). In forests at low and medium altitudes. Sumatra, Borneo, Java, Amboina.

Local names: Ihaláson (Mbo.); tandáwon (Mbo.).

After critical study of all the Philippine material cited under *Piper majusculum* Blume, and a considerable number of extra-Philippine specimens, I consider that *Piper rotundistigmum* C. DC. and *Piper leyteanum* C. DC. are not distinct from *Piper majusculum* Blume. Miquel (1843) referred Blume's species to *Piper decumanum* Linn. and to *Piper methysticum* Linn.; both of these species are very distinct from *Piper majusculum* Blume.

15. PIPER EUPODUM C. DC. Text fig. 17.

Piper eupodum C. DC. in Philip. Journ. Sci. 11 (1916) Bot. 219, Candollea 1 (1923) 247; MERR., Enum. Philip. Fl. Pl. 2 (1923) 8.

A dicœcious vine; the young branches hirsute, older ones glabrous, terete, pale brown to brown, 1.5 to 3 mm in diameter, nodes hirsute. Leaves chartaceous, ovate, 7.5 to 10.2 cm long,

FIG. 17. *Piper eupodum* C. DC.; *1*, fruiting branch, × 0.5; *2*, leaf, × 0.5; *3*, fruit with a bract attached, × 10; *4*, top and apical side views of pistillate bracts, × 10; *5*, top and side views of staminate bracts, × 10; *6*, stamens, × 10.

3.2 to 6 cm wide, base equilaterally rounded, 7-plinerved, apex acutely acuminate, glabrous above, hirtellous on the nerves beneath, reticulations more or less prominent on both surfaces; petioles densely hirsute, 8 to 13 mm long. Pistillate spikes erect, elongated, slender, 7 to 8.5 cm long, 6.5 to 7 mm in diameter; the peduncles hirsute, 3.5 to 4.6 cm long; rachis densely hirsute; bracts long-pedicellate, peltate, 2 to 2.5 mm long, disk suborbicular, glabrous, 0.75 to 1 mm wide, pedicel densely hirsute, long, 1.75 to 2 mm long; fruits free, sessile, crowded, oblong-obovoid, 2.75 to 3 mm long, 1 to 1.5 mm in diameter, angled, glabrous; stigmas 3, sessile, apical, hirtellous. Staminate spikes suberect, 7 to 8.5 cm long, 2.25 to 2.5 mm in diameter; the peduncles hirsute, 4.5 to 5 cm long; rachis densely hirsute; bracts subsessile, peltate, 0.4 to 0.5 mm long, disk rounded-obovate, about 0.75 mm wide, glabrous, imbricate, pedicel somewhat stout and pilose at the base; stamens 2, somewhat pedicellate, 0.4 to 0.5 mm long, anthers tetralocular, 2-valved, cells ellipsoid, filaments oblong, stout, longer than the anthers.

LEYTE, Dagami, *Bur. Sci. 15227 Ramos;* Jaro Buenavista, *Wenzel 1005* (type collection). In forests, altitude about 500 meters. Endemic.

A species allied to *Piper arborescens* Roxb., differing in the size and form of its leaves, the erect pistillate spikes, and in having 2 stamens only.

16. PIPER MELANOCAULON sp. nov. Text fig. 18; Plate 5.

Frutex dioicus, scandens; ramulis glabris, nigrescentibus; foliis chartaceis, ovatis, 7.5 ad 10.8 cm longis, 3.6 ad 5.8 cm latis, basi subaequilateralibus obtusis ad rotundatis, 9-plinerviis, apice

FIG. 18. *Piper melanocaulon* sp. nov.; *1*, a fruiting branch, × 0.5; *2*, leaf and mature pistillate spike, × 0.5; *3*, portion of the transverse section of a mature pistillate spike, × 7.5; *4*, side view of pistillate bracts, × 7.5.

acute acuminatis, utrinque glabris; spicis ♀ subpendulis, gracilis, 2 ad 3.6 cm longis, 5 ad 5.5 mm diametro; bracteis pedicellatis, peltatis, 1 ad 1.25 mm longis, peltis orbicularis, adpressis, crenulatis, supra marginibusque glabris; baccis liberis, sessilibus, laxis, oblongo-subobovoideis, circiter 2 mm longis, 1 mm diametro; stigmatibus 3, rotundatis, sessilibus.

A diœcious vine; the branches glabrous, terete, black, 1.5 to 3 mm in diameter. Leaves chartaceous, somewhat black, ovate, 7.5 to 10.8 cm long, 3.6 to 5.8 cm wide, base subequilaterally

obtuse to rounded, 9-plinerved, apex acutely acuminate, entirely glabrous and smooth on both surfaces, reticulations subobscure to obscure above, somewhat prominent beneath; petioles glabrous, 15 to 22 mm long. Pistillate spikes slender, subpendulous, 2 to 3.6 cm long, 5 to 5.5 mm in diameter; the peduncles glabrous, 14 to 16 mm long; rachis glabrous; bracts pedicellate, peltate, 1 to 1.25 mm long, disk orbicular, 0.4 to 0.5 mm wide, glabrous, membranaceous, appressed, crenulate, pedicel stout, swollen at the base; fruits free, sessile, oblong-subobovoid, about 2 mm long, 1 mm in diameter, glabrous; stigmas 3, rounded, sessile, apical.

PANAY, Capiz Province, Mount Bolilao, *Bur. Sci. 35725* (type in herb. Manila), *35746 Martelino and Edaño,* June 29, 1919, on the summit, altitude about 1,000 meters.

The species resembles *Piper eupodum* C. DC., but may be readily distinguished from it by its black branches and leaves, shorter peduncles and spikes, laxly arranged fruits, its glabrous rachis, and its bracts.

17. PIPER AGUSANENSE C. DC. Text fig. 19.

Piper agusanense C. DC. in Leafl. Philip. Bot. 6 (1914) 2291, Philip. Journ. Sci. 11 (1916) Bot. 221, Candollea 1 (1923) 211; MERR., Enum. Philip. Fl. Pl. 2 (1923) 2.

A diœcious vine; the branches pilose, 2 to 3 mm in diameter. Leaves chartaceous, oblong to ovate-lanceolate, 7.5 to 13 cm long, 2 to 4.5 cm wide, the lower leaves ovate, 6 to 9 cm wide, base inequilaterally subcordate-auriculate, 7- to 9-plinerved, apex acute to acutely acuminate, glabrous above, pilose on the nerves and puberulent on the parenchyma beneath, upper surface somewhat scabrous, rigid when dry, reticulations subobscure to obscure above, somewhat prominent beneath; petioles slightly pilose, 0.5 to 2 cm long, of the lower leaves 2 to 3 cm long. Pistillate spikes erect, elongated, slender, 7.5 to 9 cm long, 5 to 5.5 mm in diameter; the peduncles glabrous, 3 to 3.5 cm long; rachis glabrous; bracts subsessile to sessile, peltate, 0.3 to 0.5 mm long, disk suborbicular, 0.8 to 1 mm wide, glabrous, fleshy; fruits crowded, partly embedded in and concrescent with the rachis, oblong to oblong-subobovoid, 2 to 2.2 mm long, about 1 mm in diameter; styles sessile; stigmas bilobed, tubercular, black. Staminate spikes subpendulous, slender, 6.5 to 11.5 cm long, 2 to 4 mm in diameter; the peduncles glabrous, 2 to 3.5 cm long; rachis glabrous; bracts subsessile, peltate, 0.3 to 0.5 mm long, disk rounded-ovate, glabrous, fleshy, 1 to 1.3 mm wide;

FIG. 19. *Piper agusanense* C. DC.; *1*, leaf, × 0.5; *2*, leaf base, × 0.5; *3*, lower leaf, × 0.5; *4*, mature pistillate spike, × 0.5; *5*, top view of a fruit and a bract, × 7.5; *6*, transverse section of a mature pistillate spike, × 7.5; *7*, mature staminate spike, × 0.5; *8*, top view of staminate bracts, × 7.5; *9*, side view of a stamen, × 40; *10*, median section of two stamens, × 40.

stamens 2, subsessile, 0.3 to 0.5 mm long, anthers ellipsoid, 2-valved, filaments shorter than the anthers.

LUZON, Laguna Province, Los Baños, Mount Maquiling, *Elmer 17499*. MINDANAO, Surigao Province, Placer, *Wenzel 3058:* Agusan Province, Cabadbaran, Mount Urdaneta, *Elmer 13319* (type collection). CAMIGUIN DE MINDANAO, *Bur. Sci. 14644 Ramos*. In forests. Endemic.

Local name: Halopái (C. Bis., Mbo.).

A species characterized by its peculiar ellipsoid 2-valved anthers, its slender pistillate spikes, its fruits partly embedded in

and concrescent with the glabrous rachis, and its auriculate, somewhat scabrous leaves.

18. PIPER MERRILLII C. DC. Text fig. 20.

Piper merrillii C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 426, 11 (1916) Bot. 212, Candollea 1 (1923) 213; MERR., Enum. Philip. Fl. Pl. 2 (1923) 12.

Piper dagamiense C. DC. in Philip. Journ. Sci. 11 (1916) Bot. 211, Candollea 1 (1923) 179; MERR., Enum. Philip. Fl. Pl. 2 (1923) 7.

A dicœcious vine; the branches hirsute, 2 to 5 mm in diameter. Leaves membranaceous, with minute glandular black dots beneath, oblong-elliptic to subobovate-elliptic, 10 to 25 cm long, 4 to 13 cm wide, base somewhat narrowed, inequilateral, auriculate, 10- to 13-plinerved, apex acutely acuminate to acutely attenuate, glabrous above, hirtellous on the nerves beneath, reticulations prominent beneath; petioles hirsute, 1.5 to 3 cm long; stipules membranaceous, hirtellous on the outside, glabrous within. Pistillate spikes oblong, 1.8 to 3.2 cm long, 8 to 11 mm in diameter; the peduncles hirtellous, 5 to 10 mm long; rachis hirsute; bracts long-pedicellate, peltate, 1.5 to 2.5 mm long, disk suborbicular, 1 to 1.5 mm wide, glabrous, usually denticulate, pedicel hirsute; fruits free, partly embedded in and concrescent with the rachis, glabrous, oblong to oblong-ovoid, 3 to 3.2 mm in diameter; styles 1 to 1.5 mm; stigmas 2 or 3, papillate; seeds oblong to oblong-ovoid, glabrous, 2 to 2.8 mm long. Staminate spikes slender, 4.5 to 8 cm long, 4 to 5 mm in diameter; the peduncles hirtellous, 0.5 to 1.5 cm long; rachis hirsute; bracts pedicellate, peltate, 1 to 1.2 mm long, disk orbicular, glabrous, 1.5 to 2 mm wide, pedicel hirsute; stamens 2, subsessile to sessile, anthers oblong, apex truncate, more or less compressed, tetralocular, 4-valved.

LUZON, Isabela Province, San Mariano, *Bur. Sci. 47220 Ramos and Edaño:* Laguna Province, San Antonio, *Bur. Sci. 20557 Ramos:* Tayabas Province, Mount Binuang, *Bur. Sci. 28591 Ramos and Edaño.* ALABAT, *Bur. Sci. 48273, 48356 Ramos and Edaño.* MINDORO, Baco River, *Merrill 1809* (type of *Piper merrillii* C. DC. in herb. Manila), *4038, McGregor 178;* Mount Calavite, *Bur. Sci. 39431 Ramos;* Mount Halcon, *Bur. Sci. 40575, 40709 Ramos and Edaño.* SAMAR, Cauayan, *Bur. Sci. 17527, Ramos;* Catubig River, *Bur Sci. 24331, 24550 Ramos.* LEYTE, Dagami, *Bur. Sci. 15181 Ramos* (type collection of *Piper dagamiense* C. DC.). NEGROS, Occidental Negros Province, Canlaon Volcano, *Banks s. n., Merrill 7033;* Mount Silay, *Whitford 1547.* PANAY, Capiz Province, Mount Macosolon, *Bur. Sci.*

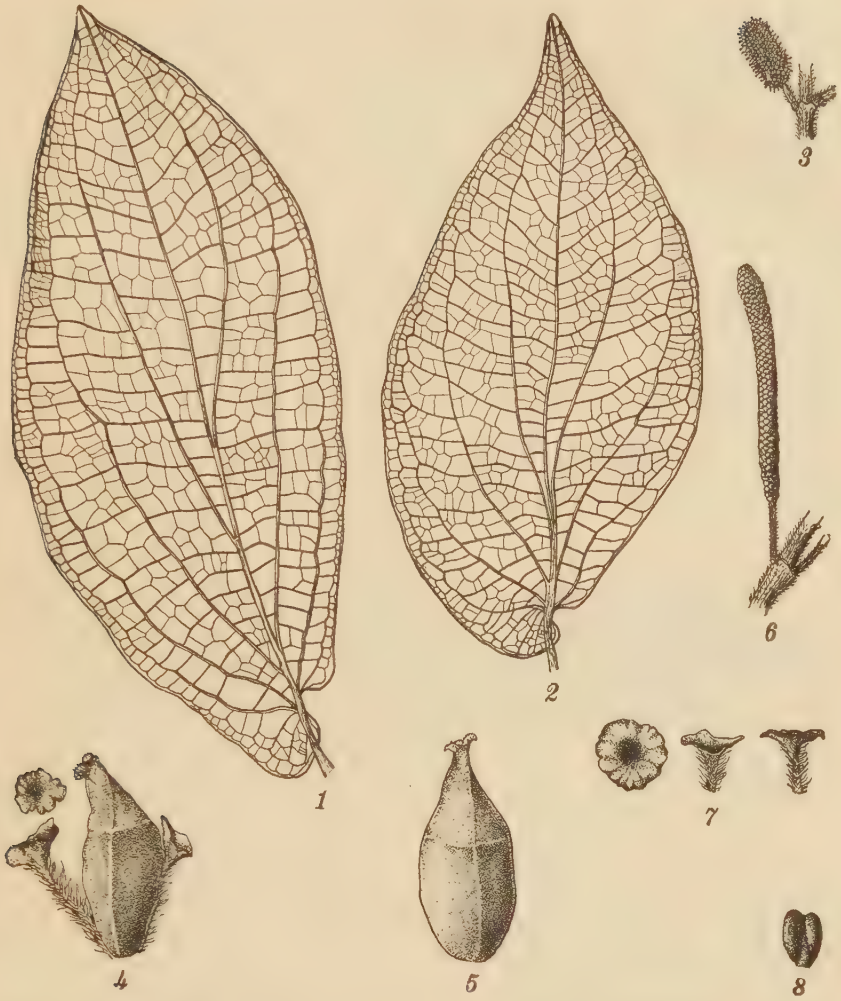

FIG. 20. *Piper merrillii* C. DC.; *1–2*, leaves, × 0.5; *3*, mature pistillate spike, × 0.5; *4*, submature fruit and bracts, × 7.5; *5*, mature fruit, × 7.5; *6*, staminate spike, × 0.5; *7*, top and side views of staminate bracts, × 7.5; *8*, stamen, × 7.5.

30777 Ramos and Edaño; Jamindan, *Bur. Sci. 31349, 31377 Ramos and Edaño;* Libacao, *Bur. Sci. 31425 Ramos and Edaño:* Antique Province, Culasi, *Bur. Sci. 32493 McGregor.* BOHOL, Valencia, *Bur. Sci. 42845 Ramos.* PALAWAN, Mount Capoas, *Merrill 9505.* MINDANAO, Davao Province, Mount Galintan, *Bur. Sci. 48876 Ramos and Edaño.* In forests at low, medium, and high altitudes, ascending to 1,250 meters. Endemic.

Local names: Buyat-halo (P. Bis.); parong (Bis.).

This species is allied to *Piper stylosum* Miq., from which it is distinguished by its auriculate leaves and much smaller fruits.

19. PIPER ARISTOLOCHIPHYLLUM sp. nov. Text fig. 21; Plate 6.

Frutex dioicus, scandens; ramulis puberulis, nigrescentibus, 2 ad 3 mm diametro; foliis oblongis, 14.5 ad 21 cm longis, 5 ad 7.5 cm latis, basi inaequilateralibus, subauriculatis, penninerviis, apice obscure acute acuminatis, supra glabris, nigrescentibus, subtus ad nervis minutissime puberulis, membranaceis; petiolo 1 ad 1.5 cm longo; spicis ♂ gracilis, cylindricis, 6 ad 9 cm longis, 3 ad 5 mm diametro; pedunculis 1 ad 1.5 cm longis, puberulis; bracteis pedicellatis, peltatis, 1 mm longis, peltis supra marginibusque glabris, orbicularis, 1 ad 1.2 mm latis, pedicellis puberulis; staminibus 2, antheris subglobosis, 4-valvatis.

A diœcious vine; the branches 2 to 3 mm in diameter, puberulent, black, terete. Leaves membranaceous, brown black when dry above, pale, silvery and with minute black glandular dots beneath, oblong, 14.5 to 21 cm long, 5 to 7.5 cm wide, base inequilaterally subauriculate, penninerved, apex obscurely and

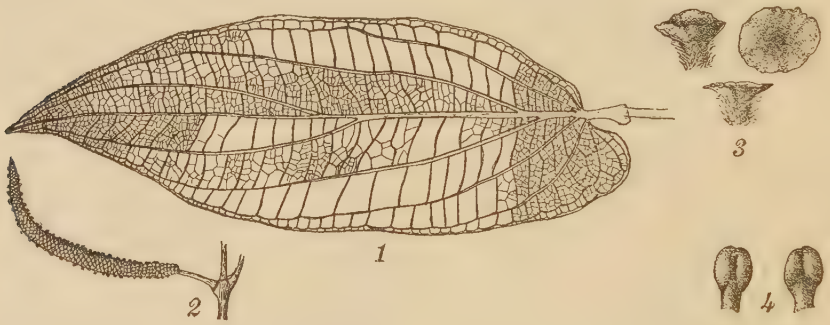

FIG. 21. *Piper aristolochiphyllum* sp. nov.; *1*, leaf, × 0.5; *2*, staminate spike, × 0.5; *3*, side and top views of staminate bracts, × 7.5; *4*, stamens, × 7.5.

acutely acuminate, glabrous above, puberulent on the nerves beneath, nerves prominently black beneath, reticulations black, rather prominent beneath; petioles 1 to 1.5 cm long, puberulent, black. Staminate spikes slender, 6 to 8 cm long, 3 to 5 mm in diameter; the peduncles 1 to 1.5 cm long, puberulent, black; rachis puberulent; bracts pedicellate, peltate, about 1 mm long, disk orbicular, glabrous, 1 to 1.2 mm wide, pedicel fleshy, puberulent; stamens 2, pedicellate, about 1 mm long, anthers subglobose, 4-valved.

LUZON, Tayabas Province, Mount Alzapan, *Bur. Sci. 45695 Ramos and Edaño* (type in herb. Manila), June 6, 1925, on forested slopes, altitude about 1,500 meters.

This species is allied to *Piper merrillii* C. DC., but differs essentially in the black, puberulent leaves, branches, peduncles, and petioles, its pedicellate stamens, and its subglobose anthers.

20. PIPER AURILIMBUM C. DC. Text fig. 22.

Piper aurilimbum C. DC. in Leafl. Philip. Bot. 3 (1910) 768, Philip. Journ. Sci. 5 (1910) Bot. 425, 11 (1916) Bot. 210, Candollea 1 (1923) 202; MERR., Enum. Philip. Fl. Pl. 2 (1923) 3.

A dicœcious vine; the young branches hirsute, older ones glabrous, terete, 2 to 4 mm in diameter. Leaves membranaceous, with numerous black glandular dots beneath, oblong-elliptic to obovate-elliptic, 10 to 18 cm long, 3.5 to 8 cm wide, base inequilaterally subcordate, prominently auriculate, 7-plinerved, very rarely penninerved, apex shortly and acutely acuminate, glabrous above, hirtellous on the nerves beneath, reticulations

FIG. 22. *Piper aurilimbum* C. DC.; *1–2*, leaves, × 0.5; *3*, mature pistillate spike, × 0.5; *4*, top and side views of pistillate bracts, × 7.5; *5*, fruit and apices of fruits, × 7.5; *6*, staminate spike, × 0.5; *7*, top and side views of staminate bracts, × 7.5; *8*, stamens, × 7.5.

somewhat obscure above, prominent beneath; petioles hirsute, 0.5 to 1 cm long, in the lower leaves up to 3.5 cm long. Pistillate spikes oblong, 2 to 4.3 cm long, 5 to 10 mm in diameter; the peduncles hirsute, 1.2 to 3 cm long; rachis pilose; bracts pedicellate, peltate, 0.8 to 1.2 mm long, disk glabrous, suborbicular, about 0.75 mm wide, pedicel fleshy, pilose; fruits oblong, acuminate, about 3 mm long, 1.2 to 1.5 mm in diameter, more or less concrescent at the base; stigmas 3, ovoid, acute; seeds glandular, oblong-obovoid, about 2 mm long. Staminate spikes about 2.5 cm long, 3 to 5 mm in diameter; the peduncles hir-

sute, 3.5 to 5 mm long; rachis pilose; bracts pedicellate, peltate, about 1 mm long, disk orbicular, 1 to 1.2 mm wide, glabrous, pedicel fleshy, pilose; stamens 2, subpedicellate, about 1 mm long, anthers oblong, rounded, tetralocular, 4-valved, filaments shorter than the anthers.

LUZON, Cagayan Province, Abulug River, *Weber 1584;* Dabba, *Bur. Sci. 13946 Ramos;* without definite locality, *Bur. Sci. 13980 Ramos;* La Union Province, Disdis, *Lete 711:* Kalinga Subprovince, Mount Masingit, *Bur. Sci. 37566, 37568, 37591 Ramos and Edaño:* Ifugao Subprovince, Mount Polis, *Bur. Sci. 19821 McGregor:* Benguet Subprovince, Baguio, *Elmer 8866* (type collection): Rizal Province, without definite locality, *Loher 14910.* In forests at medium altitudes. Endemic.

Local names: Dawn-sha-atab (Ig.); ganed (Ig.); ganid (Ig.).

This species bears considerable resemblance to *Piper merrillii* C. DC., but has more prominently auriculate leaves, subpedicellate stamens, and shorter pistillate bracts.

21. PIPER MYRMECOPHILUM C. DC. Text fig. 23.

Piper myrmecophilum C. DC. in Philip. Journ. Sci. 11 (1916) Bot. 211, Candollea 1 (1923) 178; MERR., Enum. Philip. Fl. Pl. 2 (1923) 12.

A dicœcious vine; the branches villose, terete, 2 to 4 mm in diameter. Leaves chartaceous, oblong to oblong-ovate, 17.5 to 25.5 cm long, 6 to 8.5 cm wide, base inequilaterally cordate-auriculate, 11- to 13-plinerved, with a rounded reflexed ant sac attached to the petiole, apex acutely acuminate, glabrous and shining on both surfaces, reticulations more or less prominent above, prominent beneath; petioles hirsute, 6 to 8 mm long. Pistillate spikes oblong to oblong-obovoid, 4 to 5.5 cm long, 1.8 to 2.5 cm in diameter; the peduncles hirsute, 7 to 10 mm long; rachis hirsute; bracts long-pedicellate, peltate, 3.5 to 4 mm long excluding the projections, disk small, glabrous, suborbicular, 0.5 to 1 mm wide, with 2 to 6 projections, the projections 1.1 to 1.8 mm long, multicellular, pedicel long, villose; fruits free, 8.5 to 10.5 mm long with the styles; styles very long, 6.5 to 8.5 mm long, glabrous; stigmas 2, shortly bifid, hispidulous; seeds ellipsoid, 2 to 2.2 mm long. Staminate spikes narrowly oblong, about 3 cm long, 0.5 to 0.6 mm in diameter; the peduncles hirsute, 6 to 7 mm long; rachis hirsute; bracts pedicellate, peltate, 1.5 to 2 mm long, disk glabrous, suborbicular, 0.75 to 1 mm wide, with 3 projections attached at the edge of the disk; stamens 2, pedicellate, 1.2 to 1.8 mm long, anthers

FIG. 23. *Piper myrmecophilum* C. DC.; *1*, leaf, × 0.5; *2*, base of a leaf and mature pistillate spike, × 0.5; *3*, fruit with long style and bracts, × 7.5; *4*, detail of bifid stigmas, × 10; *5*, seeds, × 7.5; *6*, detail of a projection from the pistillate bract, × 10; *7*, base of a leaf and mature staminate spike, × 0.5; *8*, top and side views of bracts and stamen, × 7.5.

oblong, tetralocular, 4-valved, filaments somewhat slender, longer than the anthers.

SAMAR, Mount Cauayan, *Bur. Sci. 17599 Ramos* (type collection); Camanabaan, *Bur. Sci. 24366 Ramos;* Pinipisakan, Catubig River, *Bur. Sci. 24345, 24346 Ramos.* LEYTE, Tigbao,

Wenzel 1464; Tacloban, *Wenzel 1778.* In damp forests at low and medium altitudes. Endemic.

This is the only Philippine species of *Piper* with myrmecophylous leaves. It is strongly characterized by the long, multicellular projections of the bracts, the long styles, the bifid, hispidulous stigmas, and the peculiar ant sac at the base of the lamina.

22. PIPER ABBREVIATUM Opiz. Text figs. 24 and 25; Plate 17, fig. 9.

Piper abbreviatum Opiz in Presl Rel. Haenk. 1 (1828) 157; C. DC. in Leafl. Philip. Bot. 3 (1910) 775; Merr., Enum. Philip. Fl. Pl. 2 (1923) 2.

Piper chaba Blume in Verh. Bat. Genoots. 11 (1826) 168, *f. 7;* C. DC., Prodr. 16[1] (1869) 347, Philip. Journ. Sci. 5 (1910) Bot. 432 (incl. formæ *b, c, d,* and *e* C. DC.), 11 (1916) Bot. 216, Candollea 1 (1923) 195, 214; F.-Vill., Novis App. (1880) 175, non Hunter As. Res. 9 (1809) 391.

Chavica chaba Miq., Syst. Pip. (1843) 251, Nov. Act. Acad. Nat. Cur. 21 (1846) Suppl. 37, *t. 31,* Fl. Ind. Bat. 1[2] (1858–59) 443.

Piper rhombophyllum C. DC. Prodr. 16[1] (1869) 352, Leafl. Philip. Bot. 3 (1910) 775, Philip. Journ. Sci. 5 (1910) Bot. 433, 11 (1916) Bot. 216, Candollea 1 (1923) 214; Vidal, Phan. Cuming. Philip. (1885) 138, Rev. Pl. Vasc. Filip. (1886) 220; Merr., Enum. Philip. Fl. Pl. 2 (1923) 14.

Chavica populifolia Miq., Syst. Pip. (1843) 248, Fl. Ind. Bat. 1[2] (1858–59) 442 non *Piper populifolium* Opiz.

Piper rhombifolium F.-Vill., Novis, App. (1880) 175, sphalm.

Piper miquelinum F.-Vill., Novis. App. (1880) 176; Merr., Enum. Philip. Fl. Pl. 2 (1923) 17.

Piper rubripunctulatum C. DC. in Perk. Frag. Fl. Philip. (1905) 158, Candollea 1 (1923) 274.

Piper parvispica C. DC. in Perk. Frag. Fl. Philip. (1905) 156, Candollea 1 (1923) 267.

Piper mearnsii C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 447, Candollea 1 (1923) 174; Merr., Enum. Philip. Fl. Pl. 2 (1923) 12.

A dicœcious vine; the branches glabrous, terete, 1.5 to 3 mm in diameter. Leaves membranaceous to chartaceous, ovate, ovate-lanceolate, elliptic-oblong or rounded-elliptic, 4 to 14 cm long, 1.5 to 6.7 cm wide, base usually equilaterally cuneate, sometimes subequilaterally acute to obtuse, rarely rounded, usually 5-plinerved, rarely 3-plinerved or 7-plinerved, apex acuminate to attenuate, the acumen acute to subobtuse, glabrous on both surfaces, somewhat glaucous on the lower surface, reticulations somewhat obscure above, more or less prominent beneath; petioles glabrous, 4 to 15 mm long, in the lower leaves up to 25 mm long. Pistillate spikes abbreviated, oblong to globose-ovoid, obtuse to rounded, 7 to 20 mm long, 7.5 to 11 mm in diameter; the peduncles glabrous, 0.8 to 2 cm long; rachis sparsely hir-

FIG. 24. *Piper abbreviatum* Opiz; *1*, flowering branch of a male plant, × 0.5; *2–3*, leaves, × 0.5; *4*, flowering branch of a female plant, × 0.5; *5*, lower leaf, × 0.5; *6–7*, leaves, × 0.5.

sute; bracts sessile, peltate, disk glabrous, transversely subelliptic to obovate, 0.5 to 0.8 mm wide; fruits crowded, coalescing, fully embedded in and concrescent with the rachis, oblanceolate

to obovoid, angled, glabrous, apex umbonate, the product of somewhat elongated styles, these about 3 mm long; stigmas 3 or 4, ovoid, sessile, apical; seeds obovoid, oblong-obovoid, or oblanceolate, 2 to 2.5 mm long. Staminate spikes slender, 2.2 to 5.7 cm long, 1.5 to 3 mm in diameter; the peduncles glabrous, 4 to 18 mm long; rachis hirsute; bracts subsessile, peltate, 0.5 to 0.6 mm long, disk transversely subelliptic, glabrous, 0.5 to 0.6 mm wide, pedicel stout, hirsute; stamens 2, pedicellate, 0.6 to 1 mm long, anthers reniform to subglobose, 2-valved, filaments slightly longer than the anthers, somewhat exerted.

FIG. 25. *Piper abbreviatum* Opiz; *1*, mature pistillate spike, natural size; *2*, top and side views of pistillate bracts, × 10; *3*, portion of the transverse section of mature pistillate spike, × 7.5; *4*, typical seeds and fruit, × 7.5; *5*, larger form of seeds, × 7.5; *6*, top and side views of staminate bracts, × 10; *7*, stamens, × 10.

LUZON, without definite locality, *Haenke s. n.* (type of *Piper abbreviatum* Opiz in herb. Prague): Cagayan Province, Enrile, *Warburg 12127;* Peñablanca, *Adduru 132:* Laguna Province, San Antonio, *Bur. Sci. 16608, 20520, 20582 Ramos;* Calauan, *Callery 64;* Mount Maquiling, Los Baños, *Elmer 17513, 18202, Juliano 1081, Bur. Sci. 17003 Robinson, Foxworthy 21, 32, Gates 5245, For. Bur. 26376 Catalan, 26902 Mabesa:* Tayabas Prov-

ince, Kabibihan, *Bur. Sci. 13282 Ramos;* Mount Binuang, *Bur. Sci. 28710, 28749 Ramos and Edaño;* Casiguran, *Bur. Sci. 2987 Mearns* (type of *Piper mearnsii* C. DC. in herb. Manila), *45569 Ramos and Edaño:* Camarines Norte Province, Paracale, *Bur. Sci. 33641 Ramos and Edaño:* Camarines Sur Province, Sagnay, *Bur. Sci. 22150 Ramos;* Mount Isarog, *Bur. Sci. 22077 Ramos:* Albay Province, without definite locality, *Cuming 834* (type of *Chavica populifolia* Miq. in herb. Kew; isotype in herb. Manila): Sorsogon Province, without definite locality, *Bur. Sci. 23464 Ramos;* Mount Bulusan, Irosin, *Elmer 14591, 16249.* POLILLO, *Bur. Sci. 10234 McGregor, 9128 Robinson.* CATANDUANES, Calolbong, *Bur. Sci. 30261 Ramos;* Bacon, *For. Bur. 29865, 29867 Denaga.* BATAN, *Bur. Sci. 6231, 6429 Robinson.* MINDORO, Mount Calavite, *Bur. Sci. 39421 Ramos;* Mount Halcon, *Bur. Sci. 4066 Ramos and Edaño.* SAMAR, Mount Canislagan, *Bur. Sci. 17507 Ramos;* Catubig River, *Bur. Sci. 24223, 24261, 24300 Ramos;* Loquilocon, *Bur. Sci. 43862 McGregor.* LEYTE, Mount Abucayan, *Bur. Sci. 41759 Edaño;* Dagami, *Wenzel 19, 40, 419, 434;* Tigbao, Tacloban, *Wenzel 1244, 1647.* SIBUYAN, Magallanes, *Elmer 12405.* PANAY, Capiz Province, Libacao, *Bur. Sci. 35303, 35312 Martelino and Edaño;* Mount Salibongbong, *Bur. Sci. 35566 Martelino and Edaño;* Mount Timbaban, *Bur. Sci. 42350 Edaño;* Mount Kinabdangan, *Bur. Sci. 45999 Edaño:* Antique Province, Culasi, *Bur. Sci. 32545 McGregor.* BOHOL, Dimiao, *Bur. Sci. 42626 Ramos;* Bilar, *Bur. Sci. 42704 Ramos.* SIARGAO, Dapa, *Bur. Sci. 34849, 34887 Ramos and Pascasio.* CAMIGUIN DE MINDANAO, Mount Catarman, *Philip. Pl. 1286 Ramos.* MINDANAO, Surigao Province, Surigao, *Bur. Sci. 34528 Ramos and Pascasio;* Placer, *Wenzel 1843, 1878, 2855;* without definite locality, *Bolster 351:* Bukidnon Province, without definite locality, *Bur. Sci. 21441 Escritor;* Tangkulan, *Bur. Sci. 24954 Fénix;* Gimbaluron, *Rola 66:* Agusan Province, without definite locality, *Bur. Sci. 15881 Fénix;* Agusan River, *Weber 1205;* Cabadbaran, Mount Urdaneta, *Elmer 13318, 13429, 13522, 13768:* Davao Province, without definite locality, *Warburg 14746* (type of *Piper rubripunctulatum* C. DC. in herb. Berlin; isotype in herb. Manila); Santa Cruz, *Copeland 1315;* Davao, *Copeland 327;* Mount Apo, *Elmer 11077, Bur. Sci. 49417, 49468, 49512 Ramos and Edaño;* Mati, *Bur. Sci. 49178 Ramos and Edaño;* Mount Dagatpan, *Warburg 14750* (type of *Piper parvispicum* C. DC. in herb. Berlin; isotype in herb. Manila); Taumo, *Warburg 14747:* Lanao Prov-

ince, Lake Lanao, Camp Keithley, *Clemens s. n.:* Zamboanga Province, Sax River, *Merrill 8253, Williams 2130;* Mount Tubuan, *Bur. Sci. 36672 Ramos and Edaño;* Malangas, *Bur. Sci. 36845, 37104, 37298 Ramos and Edaño.* BASILAN, *Bur. Sci. 15454, 16346 Reillo.* TAWITAWI, *Bur. Sci. 44218 Ramos and Edaño.* In forests at low and medium altitudes, throughout the Philippines. Borneo, Java.

Local names: Alapàpan (Mbo.); bagaybajon (Mbo.); buyo-buyo (Bik.); buyo-halo (P. Bis.); buyong-amo (Sub.); gutí-gutí (Bik.); halopai (Mbo.); kaligu-uan (Lan.); laiñgan (Sub.); lauigang (Tag., Sub.); lingolingo-daytoi (Bis.); manikatápai (Bag.); patai-patai (Sub.); samaina (Mbo.); tandanon (Mbo.).

A species characterized by its abbreviated pistillate spikes and its crowded, coalesced, and umbonate fruits.

23. PIPER BREVIAMENTUM C. DC. Text figs. 26 and 27.

Piper breviamentum C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 434, Candollea 1 (1923) 214; MERR., Enum. Philip. Fl. Pl. 2 (1923) 4.
Piper copelandii C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 447, Candollea 1 (1923) 174; MERR., Enum. Philip. Fl. Pl. 2 (1923) 15.
Piper sarcostylum C. DC. in Philip. Journ. Sci. 11 (1916) Bot. 216, Candollea 1 (1923) 214; MERR., Enum. Philip. Fl. Pl. 2 (1923) 15.

A dicœcious vine; the branches glabrous, terete, 1.5 to 5 mm in diameter. Leaves chartaceous, elliptic-lanceolate to elliptic-ovate, rarely ovate, the upper ones 10 to 14 cm long, 3 to 6.5 cm wide, rarely 5.5 to 6.5 cm long, 1.5 to 2.5 cm wide, lower leaves up to 17.5 cm long and 10 cm wide, base equilaterally acute, very rarely obtuse or rounded, 7- to 9-penninerved in the lower leaves up to 11-penninerved, apex acutely acuminate, glabrous on both surfaces, lower surface smooth, never glaucous, reticulations somewhat obscure above, prominent beneath; petioles glabrous, 6 to 15 mm long, in the lower leaves up to 35 mm long. Pistillate spikes usually abbreviated, oblong, obtuse to rounded, 1 to 2.5 cm long, 5 to 10 mm in diameter, very rarely 3.5 to 4.3 cm long; the peduncles glabrous, 7 to 15 mm long; rachis hirsute; bracts sessile, peltate, disk glabrous, orbicular, 0.5 to 0.6 mm wide; fruits coalescing, embedded in and concrescent with the rachis, apex exerted, umbonate, the product of somewhat elongated styles; stigmas 3, ovoid, hirtellous, sessile, apical; seeds usually subellipsoid, rarely oblong-subovoid, 2 to 3 mm long, 0.75 to 1.25 mm in diameter, angled. Hermaphroditic spikes like the female; stamens 2, pedicellate, 1 to 1.25

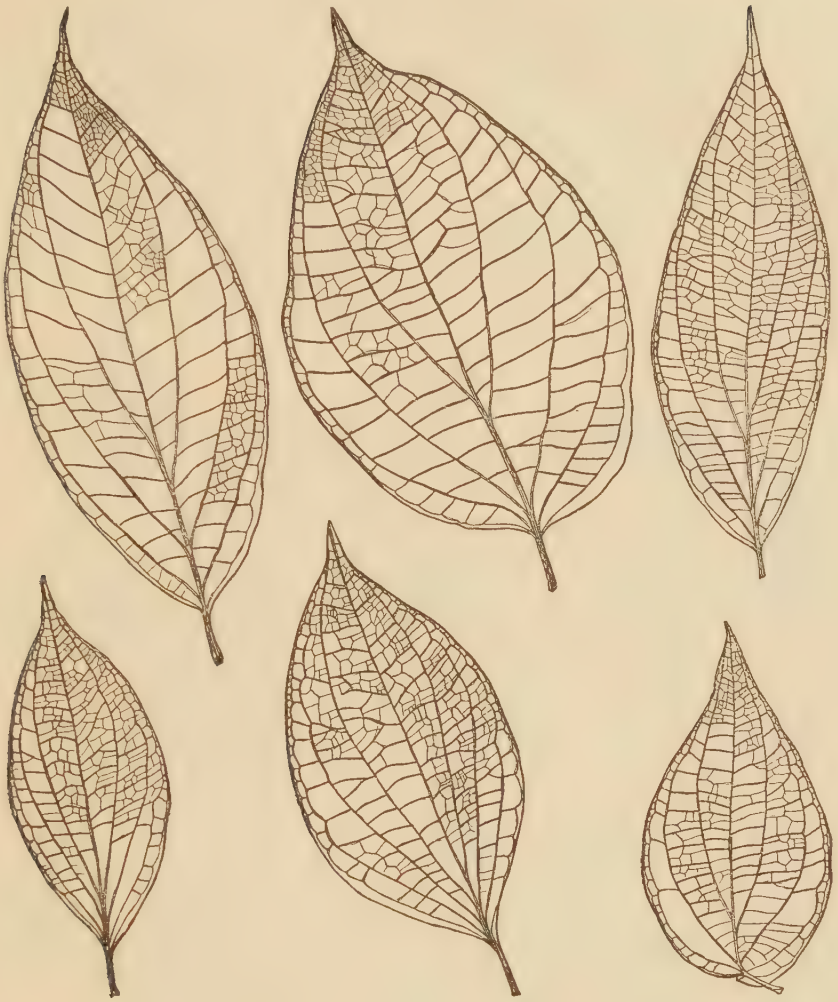

FIG. 26. *Piper breviamentum* C. DC.; leaves, × 0.5.

mm long, anthers oblong, small, tetralocular, 2-valved, filaments very slender, longer than the anthers, exerted.

LUZON, Laguna Province, Mount San Cristobal, *Juliano 1088:* Tayabas Province, Mount Binuang, *Bur. Sci. 28722 Ramos and Edaño.* LEYTE, Jaro, Buenavista, *Wenzel 802;* Tigbao, *Wenzel 1585.* PANAY, Capiz Province, Jamindan, *Bur. Sci. 30937, 31197, 31210, 31380 Ramos and Edaño;* Libacao, *Bur. Sci. 35305, 35515 Martelino and Edaño;* Mount Agsamilig, *Bur. Sci. 46033 Edaño;* Mount Kinablagan, *Bur. Sci. 46081 Edaño.* BOHOL,

Batuan River, *Bur. Sci. 42656 Ramos;* Bilar, *Bur. Sci. 42698 Ramos;* Kalingohan, *Bur. Sci. 42797 Ramos;* Valencia, *Bur. Sci. 42831 Ramos.* MINDANAO, Surigao Province, Placer, *Wenzel 1894, 1905, 2805, 2881, 3195;* Surigao, *Bur. Sci. 34409, 34467 Ramos and Pascasio:* Agusan Province, Agusan River, *Merrill 7305* (type collection of *Piper sarcostylum* C. DC.): Davao Province, Todaya, *Copeland 1298* (type of *Piper copelandii* C. DC. in herb. Manila): Zamboanga Province, Sax River, *Williams 2104* (type of *Piper breviamentum* C. DC. in herb. Manila). In forests at low and medium altitudes, ascending to 1,200 meters. Endemic.

FIG. 27. *Piper breviamentum* C. DC.; *1*, portion of the transverse section of a mature pistillate spike, × 7.5; *2*, seeds, × 7.5; *3*, side and top views of staminate bracts, × 10; *4*, stamens, × 10.

Local name: Buyong-sinhalo (P. Bis.).

A species closely allied to *Piper abbreviatum* Opiz, differing in its penninerved, never glaucous leaves. It is also differentiated by having hermaphroditic spikes. *Piper copelandii* C. DC. was erroneously placed under section *Coccobryon* by C. de Candolle.[6] It actually belongs to the section *Eupiper.*

Var. PUBERULINERVUM var. nov.

Subtus foliis ad nervis puberulis; spicis hermaphroditis.

Nerves on the lower surface of the leaves puberulent; spikes hermaphroditic.

MINDANAO, Bukidnon Province, Mount Candoon, *Bur. Sci. 38832 Ramos and Edaño* (type in herb. Manila), June 25, 1920, in forests, altitude about 1,150 meters.

This is distinguished from the species by the nerves on the lower surface of the leaves being puberulent.

[6] Candollea 1 (1923) 174.

24. PIPER PARCIRAMEUM C. DC. Text fig. 28.

Piper parcirameum C. DC. in Leafl. Philip. Bot. 3 (1910) 781, Philip. Journ. Sci. 5 (1910) Bot. 445, Candollea 1 (1923) 211; MERR., Enum. Philip. Fl. Pl. 2 (1923) 13.

A lax undershrub, about 0.6 meter high; the branches glabrous, smooth, subterete, 2 to 4.5 mm in diameter. Leaves chartaceous, with conspicuous dark red dots beneath, oblong-elliptic to lanceolate, 14 to 23 cm long, 3.5 to 7 cm wide, base inequi-

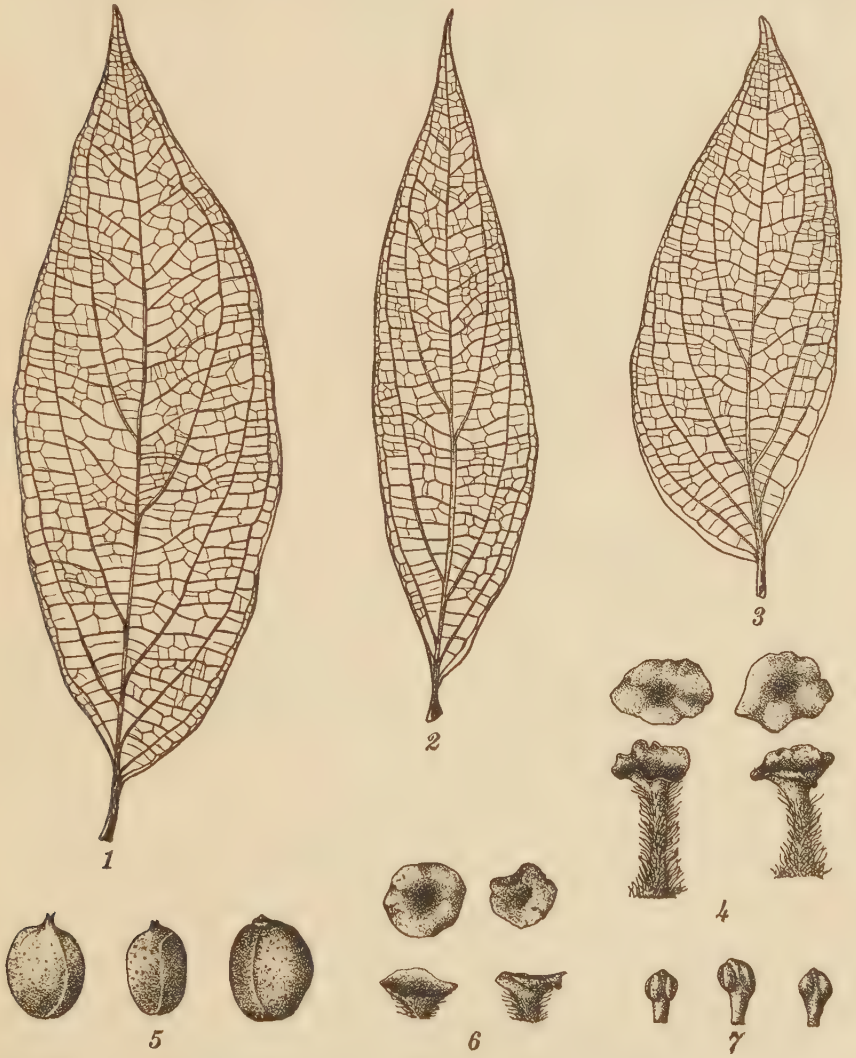

FIG. 28. *Piper parcirameum* C. DC.; *1–3*, leaves, × 0.5; *4*, top and side views of pistillate bracts, × 10; *5*, fruits, × 7.5; *6*, top and side views of staminate bracts, × 10; *7*, stamens, × 10.

laterally and obliquely acute, penninerved, nerves about 9 on each side of the midrib, apex acutely acuminate to long acutely attenuate, glabrous above, hirtellous on the nerves beneath, reticulations somewhat obscure above, rather prominent beneath; petioles glabrous, 7 to 15 mm long. Pistillate spikes somewhat abbreviated, 1.3 to 2.5 cm long, 5 to 7 mm in diameter; the peduncles glabrous, 1.3 to 2.7 cm long; rachis villose; bracts long-pedicellate, peltate, 1.5 to 2 mm long, disk subelliptic to suborbicular, 0.75 to 1 mm wide, glabrous, subimbricate, pedicels villose; fruits free, never crowded, base partly embedded in and concrescent with the rachis, oblong to subglobose, 1.75 to 2 mm long, 1 to 1.5 mm in diameter, tubercled all over; stigmas 3, minute, suberect to erect, ovoid, acute. Staminate spikes 2.5 to 3.8 cm long, 2.5 to 2.75 mm in diameter; the peduncles glabrous, 12 to 16 mm long; rachis villose; bracts subsessile, peltate, 0.3 to 0.5 mm long, disk orbicular, 0.75 to 1 mm wide, subimbricate, glabrous; stamens 2, pedicellate, 0.5 to 0.75 mm long, anthers ovoid, tetralocular, 2-valved, connective above the loculi never enlarged, filaments as long as or slightly longer than the anthers, more or less slender, exerted.

MINDANAO, Davao Province, Mount Apo, *Elmer 10899* (type collection), *11274*, *Bur. Sci. 15747 Clemens.* In forests, altitude about 900 meters. Endemic.

Local names: Poruan (Bag.); salimbañgon (Bag.).

Piper celtidiforme Opiz, now placed under a new section (*Penninervia*), was probably derived from a species similar to this. This species has penninerved leaves; the fruits and pistillate bracts most resembling those of *Piper celtidiforme* Opiz. On the other hand, the anthers present features of the *Eupiper* section rather than those of the *Penninervia* section, but also show indications that the connective above the loculi is on the way to enlargement.

25. PIPER COSTULATUM C. DC. Text fig. 29.

Piper costulatum C. DC. in Leafl. Philip. Bot. 3 (1910) 764, Philip. Journ. Sci. 5 (1910) Bot. 420, 11 (1916) Bot. 208, Candollea 1 (1923) 180; MERR., Enum. Philip. Fl. Pl. 2 (1923) 7.

Piper podandrum C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 436, 11 (1916) Bot. 217, Candollea 1 (1923) 188; MERR., Enum. Philip. Fl. Pl. 2 (1923) 13.

A diœcious vine; the branches glabrous, costulate, terete, 0.75 to 1.5 mm in diameter. Leaves thin, membranaceous, with minute brown dots beneath, narrowly linear to ovate-lanceolate or ovate, 4 to 12.5 cm long, 0.4 to 3.3 cm wide, base equilaterally

to subequilaterally repand to cordate, rarely subacute, usually 5- to 7-nerved, sometimes 5- to 7-plinerved, apex narrowed, acute, acumen with minute apiculum, glabrous on both surfaces, reticulations somewhat prominent on both surfaces; petioles glabrous, 4 to 10 mm long. Pistillate spikes abbreviated, oblong to globose, 10 to 13 mm long, 8 to 10 mm in diameter; the

FIG. 29. *Piper costulatum* C. DC.; *1*, leaf with young pistillate spike, × 0.5; *2*, leaf with mature staminate spike, × 0.5; *3*, base of a leaf and mature pistillate spike, × 0.5; *4*, leaf base, × 0.5; *5*, leaves and young staminate spike, × 0.5; *6*, flowering male branch, × 0.5; *7*, top view of stigmas, × 10; *8*, top and side views of pistillate bracts, × 7.5; *9*, fruits, × 7.5; *10*, portion of the transverse section of a mature pistillate spike, × 7.5; *11*, top and side views of staminate bracts, × 10; *12*, stamens, × 10.

peduncles glabrous, 2 to 4.5 mm long; rachis hirtellous; bracts sessile, peltate, disk orbicular, 0.5 to 0.75 mm wide, glabrous; fruits glabrous, free only near the apex, globose to oblong-obovoid, obtuse to rounded, about 3 mm long, 2.5 to 3 mm in diameter; stigmas 3, ovoid, acute, sessile, apical; seeds oblong to globose, about 2.5 mm long. Staminate spikes 2.5 to 4 cm long,

1.5 to 2 mm in diameter; the peduncles glabrous, 2.5 to 5 mm long; rachis hirtellous, bracts subsessile to sessile, peltate, disk orbicular, about 0.5 mm wide, glabrous; stamens 2, subsessile or sessile, about 0.25 mm long, anthers small, subglobose to reniform, bilocular, 2-valved.

LUZON, Cagayan Province, Abulug River, *Bur. Sci. 13838 Ramos:* Isabela Province, Mount Moises, *Bur. Sci. 47337 Ramos and Edaño:* Nueva Viscaya Province, Noso to Imugan, *Bur. Sci. 20071 McGregor;* Caraballo Mountain, *Loher 13745:* Nueva Ecija Province, Mount Umingan, *Bur. Sci. 26450 Ramos and Edaño:* Zambales Province, without definite locality, *For. Bur. 8141 Curran and Merritt* (type collection of *Piper podandrum* C. DC.) ; Tapolao, *Bur. Sci. 5053 Ramos:* Bataan Province, Lamao River, Mount Mariveles, *Elmer 6805* (type collection of *Piper costulatum* C. DC.), *Whitford 129, Williams 415, 743, Merrill 3248, For. Bur. 209 Barnes, 2097, 2394 Borden;* Mount Mariveles, *Copeland 258, Merrill 3768;* Lamao Forest Reserve, *For. Bur. 6221, 6222, 6271 Curran, 1597 Foxworthy:* Rizal Province, Mount Lumutan, *Bur. Sci. 42300 Ramos;* Pamingtingan, *Loher 13150;* without definite locality, *Loher 14229, 14382:* Tayabas Province, Mount Dingalan, *Bur. Sci. 26624 Ramos and Edaño;* Mount Binuang, *Bur. Sci. 28626, 28661, 28746 Ramos and Edaño.* CATANDUANES, Santo Domingo River, *Bur. Sci. 30495 Ramos.* In forests at low and medium altitudes, ascending to 1,500 meters. Endemic.

Local name: Sobo-manók (Tag.).

This species, which is represented by numerous collections, is restricted to Luzon and Catanduanes, and can be readily distinguished by its narrowly linear to ovate-lanceolate or ovate, membranaceous leaves, with a minute apiculum at the apex, and with repand to cordate bases and its abbreviated, oblong to globose pistillate spikes.

26. PIPER CACUMINUM C. DC. Text fig. 30.

Piper cacuminum C. DC. in Leafl. Philip. Bot. 3 (1910) 765, Philip. Journ. Sci. 5 (1910) Bot. 421, Candollea 1 (1923) 182; MERR., Enum. Philip. Fl. Pl. 2 (1923) 5.

A dicœcious vine; the branches glabrous, terete, 2 to 2.5 mm in diameter. Leaves membranaceous, narrowly oblong-lanceolate, 8.5 to 11 cm long, 2 to 2.5 cm wide, base subequilaterally subacute, 5-nerved, apex narrowed, acute, glabrous on both surfaces, reticulations subobscure above, more or less prominent beneath; petioles glabrous, 7 to 10 mm long, in the lower leaves

up to 1.7 cm long. Pistillate spikes abbreviated, oblong, about 1.6 cm long, 1 cm in diameter; the peduncles glabrous, about 1.5 cm long; rachis hirsute; bracts sessile, peltate, 1.2 to 1.5 mm long, disk suborbicular, about 1 mm wide, glabrous; fruits free at the apex only, ovoid, acute, 3.5 to 4 mm long, about 3.5 mm in diameter, glabrous; stigmas 3, rounded, sessile, apical; seeds glabrous, elliptic-ovoid to oblong-subobovoid, 2.5 to 3.5 mm long.

LUZON, Bataan Province, Mount Mariveles, *Elmer 6890* (type in herb. Manila), in the mossy forests near the summit. Endemic.

FIG. 30. *Piper cacuminum* C. DC.; *1*, leaf and mature pistillate spike, × 0.5; *2*, side view of pistillate bracts, × 7.5; *3*, fruit, × 7.5; *4*, top view of a fruit, × 7.5; *5*, seeds, × 7.5.

This species is allied to *Piper costulatum* C. DC. but differs in the base of its lamina never being cordate and in its rounded stigmas.

27. PIPER HALCONENSE C. DC. Text fig. 31.

Piper halconense C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 422, Candollea 1 (1923) 183, 212; MERR., Enum. Philip. Fl. Pl. 2 (1923) 9.

Piper cagayanense C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 435, 11 (1916) Bot. 217, Candollea 1 (1923) 196; MERR., Enum. Philip. Fl. Pl. 2 (1923) 5.

An erect dicœcious undershrub; the branches glabrous, terete, 1.5 to 2 mm in diameter. Leaves membranaceous, with minute black dots beneath, ovate-lanceolate to elliptic-lanceolate, 6 to

15 cm long, 1.5 to 5.5 cm wide, base equilaterally to subequilaterally acute to subrounded, 7-nerved or 7-plinerved, apex acutely attenuate, glabrous on both surfaces, to somewhat hirtellous on the nerves beneath, reticulations more or less obscure above, prominent beneath; petioles glabrous, 5 to 10 mm long. Pistillate spikes abbreviated, oblong, 1 to 2.3 cm long, 5 to 8 mm in diameter; the peduncles glabrous, 4 to 10 mm long; rachis

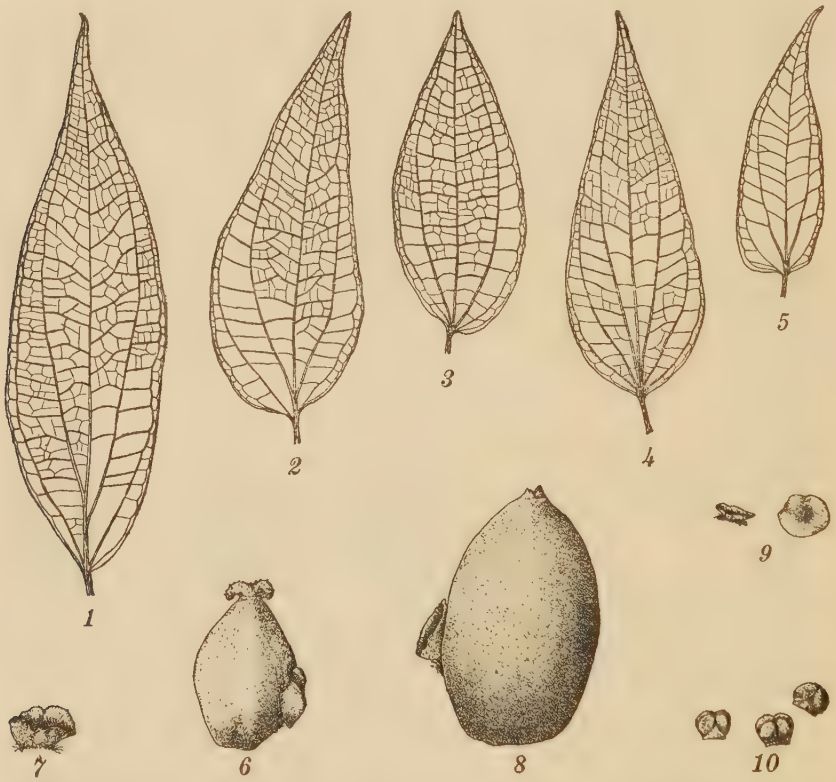

FIG. 31. *Piper halconense* C. DC.; *1–5*, leaves, × 0.5; *6*, young fruit with bract attached, × 10; *7*, side view of a pistillate bract, × 10; *8*, mature fruit with bract attached, × 10; *9*, side and top views of staminate bracts, × 10; *10*, stamens, × 10.

hirsute; bracts sessile, peltate, disk orbicular, 0.75 to 1 mm wide, glabrous; fruits free, base partly embedded in the rachis, oblong to oblong-ovoid, 2.5 to 3 mm long, 1.5 to 2 mm in diameter, glabrous, apex narrowed; stigmas 3, ovoid, sessile, apical; seeds oblong, mucronate, 2 to 2.3 mm long. Staminate spikes usually curved at the apex, 2 to 3 cm long, 1.5 to 2 mm in diameter; the peduncles glabrous, 2.5 to 7 mm long; rachis hirsute; bracts sessile, peltate, about 0.25 mm long, disk orbicular, 0.5 to 0.75

mm wide, glabrous; stamens 2, sessile, about 0.4 mm long, anthers globose to reniform, about 0.4 mm wide.

LUZON, Cagayan Province, Pamplona, *Bur. Sci. 7484 Ramos* (type of *Piper cagayanense* C. DC. in herb. Manila); Tauit, Apiao, *Bur. Sci. 10755 Worcester:* Isabela Province, San Mariano, *Bur. Sci. 46835 Ramos and Edaño:* Apayao Subprovince, Mount Sulu, *Bur. Sci. 28351, 28369 Fénix:* Zambales Province, Iba, *Bur. Sci. 4700 Ramos;* Mount Tapulao, *For. Bur. 8076 Curran and Merritt:* Tayabas Province, Lucban, *Bur. Sci. 47412, 47356 McGregor;* Mount Banahao, *Bur. Sci. 47435 McGregor:* Sorsogon Province, Irosin, Mount Urdaneta, *Elmer 14706, 15778, 17310.* MINDORO, Mount Halcon, *For. Bur. 4393 Merritt* (type of *Piper halconense* C. DC. in herb. Manila), *Merrill 5773, Bur. Sci. 40607, 40725 Ramos and Edaño.* MINDANAO, Agusan Province, Cabadbaran, Mount Urdaneta, *Elmer 13787.* In forests at medium and high altitudes, ascending to 1,500 meters. Endemic.

Local names: Famsaon (Mbo.); tapis-buyañgan (Mang.).

This species is nearly related to *Piper costulatum* C. DC., but has much larger leaves, whose bases are never cordate, and oblong to oblong-ovoid fruits.

28. **PIPER ATROSPICUM** C. DC. Text fig. 32.

Piper atrospicum C. DC. in Philip. Journ. Sci. 11 (1916) Bot. 208, Candollea 1 (1923) 182; MERR., Enum. Philip. Fl. Pl. 2 (1923) 3.

A dicœcious vine; the branches glabrous, slightly costulate, terete, with rather short internodes. Leaves dark brown to black, oblong-ovate, 6 to 7.8 cm long, 2.5 to 3.8 cm wide, base equilaterally to subequilaterally acute to obtuse, 6- or 7-nerved,

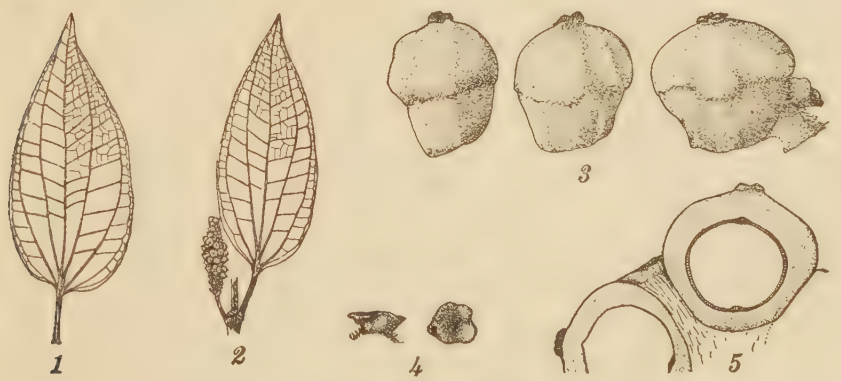

FIG. 32 *Piper atrospicum* C. DC.; *1*, leaf, × 0.5; *2*, leaf and mature pistillate spike, × 0.5; *3*, fruits, × 7.5; *4*, side and top views of pistillate bracts, × 7.5; *5*, portion of the transverse section of mature pistillate spike, × 7.5.

apex acutely acuminate, glabrous on both surfaces, reticulations obscure above, prominent beneath; petioles glabrous, 1 to 1.5 cm long. Pistillate spikes abbreviated, black, narrowly oblong, 1.3 to 2.3 cm long, 5 to 6.5 mm in diameter; the peduncles glabrous, 6 to 8 mm long; rachis hirtellous; bracts sessile, peltate, about 0.75 mm long, disk glabrous, orbicular, about 0.75 mm wide; fruits free at the apex only, globose, 2.5 to 3 mm long, about 2 mm in diameter; stigmas 3, ovoid, acute, sessile, apical; seeds globose.

LEYTE, Dagami, *Bur. Sci. 15359 Ramos* (type collection), in mossy forests. Endemic.

This species in its more significant characters is very close to *Piper halconense* C. DC., but differs in its dark-colored, chartaceous leaves, branches, peduncles, and spikes and its globose fruits and seeds.

29. PIPER LONGIVAGINANS C. DC. Text fig. 33.

Piper longivaginans C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 444, 11 (1916) Bot. 219 (incl. forma *b* C. DC.), Candollea 1 (1923) 204; MERR., Enum. Philip. Fl. Pl. 2 (1923) 3.

Piper magallanesanum C. DC. in Philip. Journ. Sci. 11 (1916) Bot. 212, Candollea 1 (1923) 185, 193; MERR., Enum. Philip. Fl. Pl. 2 (1923) 11.

Piper crassinodum C. DC. in Leafl. Philip. Bot. 3 (1910) 780, Philip. Journ. Sci. 5 (1910) Bot. 445, Candollea 1 (1923) 208, 211; MERR., Enum. Philip. Fl. Pl. 2 (1923) 7.

A dicœcious vine; the branches glabrous, terete, 1.25 to 4 mm in diameter. Leaves membranaceous to chartaceous, dark brown to black when dry, elliptic-lanceolate to elliptic-ovate or oblong-ovate, 7.5 to 18 cm long, 2.2 to 9 cm wide, base subinequilaterally to inequilaterally, rarely equilaterally acute to obtuse, 7-plinerved, apex acutely attenuate to acutely acuminate, glabrous on both surfaces or glabrous above and minutely puberulent on the nerves beneath, reticulations somewhat obscure above, rather prominent beneath; petioles glabrous to sparsely hirtellous, vaginate their whole length, 3 to 9 mm long, in the lower leaves up to 13 mm long. Pistillate spikes oblong, 1.5 to 2.5 cm long, 6 to 10 mm in diameter; the peduncles glabrous to sparsely hirtellous, 8 to 14 mm long; rachis hirtellous; bracts sessile, peltate, disk glabrous, orbicular, about 0.75 mm wide; fruits glabrous, free, base partly embedded in and concrescent with the rachis, oblong-obovoid, acute, 3 to 3.5 mm long, 2.25 to 2.5 mm in diameter; seeds oblong, 2.25 to 2.5 mm long, umbonate; stigmas 3 or 4, oblong, short, sessile, apical. Staminate

FIG. 33. *Piper longivaginans* C. DC.; *1–2*, leaves, × 0.5; *3*, detail of petiole, enlarged; *4*, branch, × 0.5; *5*, leaf and mature staminate spike, × 0.5; *6*, mature pistillate spike, × 0.5; *7*, apex of the pistillate spike, × 2.25; *8*, fruits, × 5; *9*, seeds, × 5; *10*, top view of pistillate bracts, × 10; *11*, top view of staminate bracts, × 10; *12*, side view of staminate bract and stamens, × 10.

spikes recurved, black when dry, 3 to 7.5 cm long, 1.75 to 2 mm in diameter; the peduncles glabrous to sparsely hirtellous, 3 to 9 mm long; rachis hirtellous; bracts sessile, peltate, disk glabrous, orbicular, 0.5 to 0.6 mm wide; stamens 2, subsessile, anthers reniform, tetralocular, 2-valved.

LUZON, Nueva Ecija Province, Mount Umingan, *Bur. Sci. 26496 Ramos and Edaño:* Rizal Province, Montalban, *Loher 12141;* Balacbac, *Loher 13021;* Pamingtingan, *Loher 13505;* Mount Lumutan, *Bur. Sci. 42252 Ramos, 29669, 29720 Ramos and Edaño;* Mount Irid, *Bur. Sci. 41864 Ramos, 48510, 48512 Ramos and Edaño;* Mount Tokduanbanog, *Bur. Sci. 48607 Ramos and Edaño:* Laguna Province, Mount San Cristobal, *Gates 6432, Juliano 1079, 1087;* Mount Banahao, *Bur. Sci. 6069 Robinson* (type collection of *Piper longivaginans* C. DC.), *27972 Ocampo, Quisumbing 1248, Baker 2423:* Tayabas Province, Lucban, *Elmer 8042* (type collection of *Piper crassinodum* C. DC.); Mount Binuang, *Bur. Sci. 28723, 28797 Ramos and Edaño;* Mount Tulaog, *Bur. Sci. 29094, 29120 Ramos and Edaño:* Camarines Sur Province, Mount Isarog, *Bur. Sci. 22057 Ramos.* SIBUYAN, Mount Giting-giting, *Elmer 12313 p. p.* (type collection of *Piper magallanesanum* C. DC.), *12313 p. p.* (type collection of *Piper longivaginans* C. DC. forma *b* C. DC.). In forests at medium and high altitudes, ascending to 2,500 meters. Endemic.

Local names: Bayóng-ukaí (Bik.); maraklít-salusalú (Ig.); salusalong-bata (Ig.).

The alliance of this species is with *Piper halconense* C. DC., from which it is distinguished by its dark brown to black leaves, and black spikes and its petioles being vaginate their whole length. Perhaps this species is allied to *Piper nigrescens* Blume.

30. PIPER DELICATUM C. DC. Text fig. 34.

Piper delicatum C. DC. in Leafl. Philip. Bot. 3 (1910) 778, Philip. Journ. Sci. 5 (1910) Bot. 444 (incl. var. *glabrum* C. DC.), 11 (1916) Bot. 219 (incl. forma *b* C. DC.), Candollea 1 (1923) 193, 203; MERR., Enum. Philip. Fl. Pl. 2 (1923) 8.

Piper polisanum C. DC. in Philip. Journ. Sci. 11 (1916) Bot. 209, Candollea 1 (1923) 183; MERR., Enum. Philip. Fl. Pl. 2 (1923) 14.

A diœcious, slender vine; the young branches usually hirtellous, older ones glabrous, terete, pale, 1 to 2.5 mm in diameter. Leaves chartaceous, with brown to black dots beneath, narrowly ovate-lanceolate to narrowly elliptic-lanceolate, 3 to 9 cm long, 0.6 to 2 cm wide, base equilaterally to subequilaterally acute, 5-plinerved, apex acutely acuminate, glabrous on both surfaces,

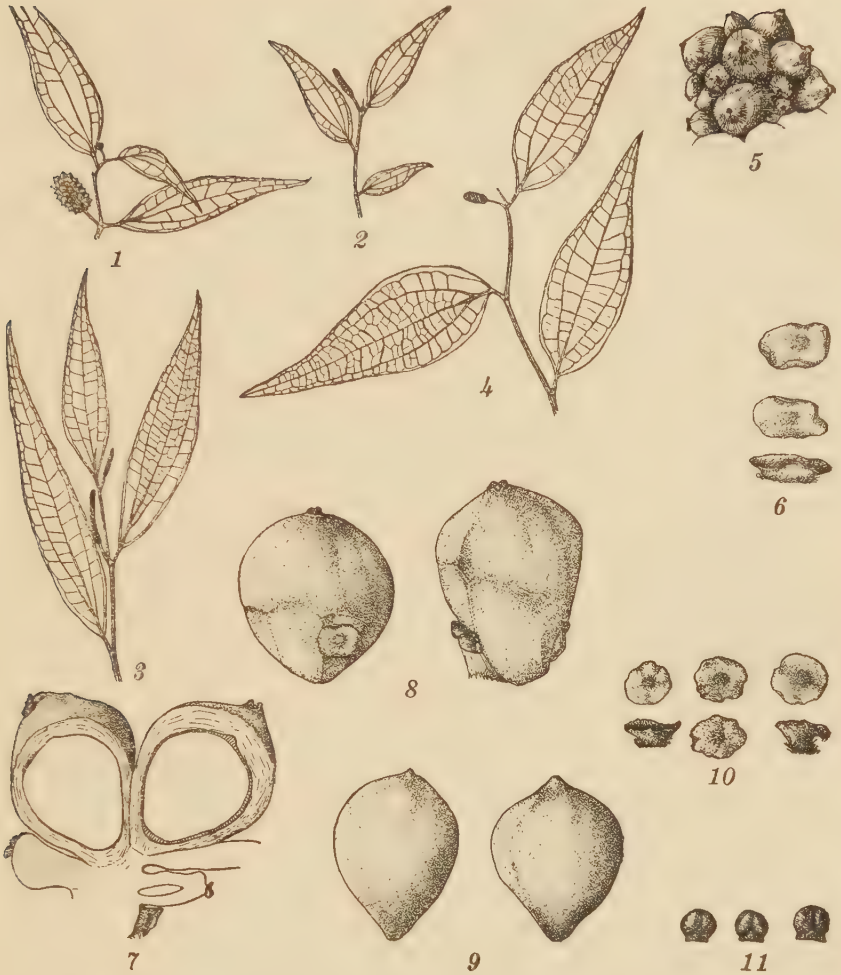

FIG. 34. *Piper delicatum* C. DC.; *1*, branch with mature pistillate spike, × 0.5; *2*, flowering branch of a male plant, × 0.5; *3*, flowering branch of a male plant, × 0.5; *4*, flowering branch of a female plant, × 0.5; *5*, apex of a pistillate spike, × 2.25; *6*, top and side views of pistillate bracts, × 10; *7*, portion of the transverse section of a mature pistillate spike, × 7.5; *8*, fruits with bracts attached, × 7.5; *9*, seeds, × 7.5; *10*, top and side views of staminate bracts, × 10; *11*, stamens, × 10.

or somewhat puberulent on the nerves beneath, reticulations somewhat obscure above, prominent beneath; petioles glabrous to sparsely hirtellous, 4 to 11 mm long, in the lower leaves up to 22 mm long, vaginate at the base. Pistillate spikes abbreviated, oblong, erect, 9 to 20 mm long, 6 to 9 mm in diameter; the peduncles glabrous, 6 to 17 mm long; rachis hirtellous; bracts sessile, peltate, disk glabrous, suborbicular, 0.75 to 1 mm wide; fruits free, base partly embedded in and concrescent with the

rachis, obovoid, subacute, 2 to 3.5 mm long, 1.75 to 2.75 mm in diameter; stigmas 3, rarely 4, ovoid, acute, sessile, apical; seeds glabrous, smooth, subovoid-elliptic, subacute, 2.25 to 3.25 mm long. Staminate spikes erect, 13 to 20 mm long, 1.5 to 2.5 mm in diameter; the peduncles glabrous or rarely hirtellous, 3 to 5 mm long; rachis hirtellous; bracts subsessile, peltate, 0.25 to 0.4 mm long, disk glabrous, orbicular, 0.6 to 0.75 mm wide; stamens 2, subsessile, anthers globose, 2-valved.

LUZON, Ilocos Norte Province, Mount Palimlim, *Bur. Sci. 33281 Ramos:* Lepanto Subprovince, Mount Data, *Merrill 4494, For. Bur. 15997 Bacani, Bur. Sci. 40278 Ramos and Edaño:* Bontoc Subprovince, Malamey, *Vanoverbergh 1140;* Bauco, *Vanoverbergh 1167;* Mount Masapilid, *Bur. Sci. 37938, 37962 Ramos and Edaño;* Mount Caua, *Bur. Sci. 38069 Ramos and Edaño:* Ifugao Subprovince, Mount Polis, *Bur. Sci. 19817* (type collection of *Piper polisanum* C. DC.), *19815, 19816 McGregor:* Benguet Subprovince, Baguio, *Elmer 8583* (type collection of *Piper delicatum* C. DC.); Mount Santo Tomas, *Williams 1216* (type of *Piper delicatum* C. DC. var. *glabrum* C. DC. in herb. Manila), *For. Bur. 11092 Whitford, 15604 Curran, Bur. Sci. 5403 Ramos, Merrill 11718, McClure 16031;* Pauai, *Clemens 9160, Bur Sci. 4454 Mearns, 8497 McGregor, 31693 Santos;* Mount Tonglon, *For. Bur. 4964 Curran, Philip. Pl. 750 Merrill, Merrill 4820, Bur. Sci. 5461 Ramos.* In forests, usually at high altitudes, to about 2,400 meters. Endemic.

Local names: Maniniak (Ig.); umum (Ig.).

This species is certainly close to *Piper halconense* C. DC., but differs in its erect pistillate and staminate spikes, the latter never curved at the apex, its obovoid fruits and seeds, and also in the size, form, and venation of the leaves, which are usually smaller and narrow, and the bases of the lamina acute, and 5-plinerved. The form with smaller leaves bears resemblance to *Piper curtifolium* C. DC. but differs in the form and venation of the lamina and the subsessile stamens.

31. PIPER CURTIFOLIUM C. DC. Text fig. 35.

Piper curtifolium C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 421, Candollea 1 (1923) 181; MERR., Enum. Philip. Fl. Pl. 2 (1923) 7.

A dicœcious vine; the branches glabrous, smooth, older ones lenticellate and rugose, terete, 1 to 3 mm in diameter. Leaves membranaceous to chartaceous, with few scattered black dots, usually dark colored, ovate to elliptic-ovate, 2.5 to 6.5 cm long, 1 to 3.5 cm wide, base equilaterally to subequilaterally acute,

sometimes obtuse, 5- to 7-nerved, apex shortly and acutely acuminate, glabrous on both surfaces, reticulations subobscure to obscure above, prominent beneath; petioles glabrous, 3 to 12 mm long, in the lower leaves up to 30 mm long. Pistillate spikes abbreviated, oblong, 8 to 13 mm long, 5 to 7 mm in diameter; the peduncles glabrous, 4.5 to 7 mm long; rachis hirtellous; bracts subsessile, peltate, 0.75 to 1 mm long, disk glabrous, orbicular, 0.75 to 1 mm wide; fruits partly embedded in the rachis, globose to subglobose, subacute, 2 to 3 mm long, 1.75 to 2 mm in diameter, glabrous; stigmas 3 or 4, ovoid, acute, sessile, apical. Staminate spikes 1.8 to 2.2 cm long, 1 to 1.5 mm in diameter; the peduncles glabrous, about 5 mm long; rachis hirtellous; bracts subpedicellate, peltate, 0.5 to 0.75 mm long, disk glabrous, orbicular, 0.5 to 0.75 mm wide; stamens 2, sessile, anthers subglobose, bilocular, 2-valved.

FIG. 35. *Piper curtifolium* C. DC.; *1–4*, leaves, × 0.5; *5*, portion of pistillate spike, × 7.5; *6*, fruits, × 7.5; *7*, side view of pistillate bracts, × 7.5; *8*, side and top views of staminate bracts, × 10; *9*, stamens, × 10.

LUZON, Ilocos Norte, Mount Palimlim, *Bur. Sci. 33363 Ramos:* Abra Province, Mount Paraga, *Bur. Sci. 7107 Ramos* (type of *Piper curtifolium* C. DC. in herb. Manila) : Bontoc Subprovince, Mount Puquis, *Bur. Sci. 37844 Ramos and Edaño:* Benguet Subprovince, Mount Pulogloco, *Bur. Sci. 40406 Ramos and Edaño:* Rizal Province, Mount Lumutan, *Bur. Sci. 42315 Ramos:* Tayabas Province, Mount Binuang, *Bur. Sci. 28781, 28664 Ramos and Edaño.* In forests at higher altitudes, ascending to 2,250 meters. Endemic.

A species belonging in the group with *Piper halconense* C. DC. and *Piper delicatum* C. DC. and being closely allied to *Piper delicatum* C. DC., differing from the last by the venation and form of its lamina and its sessile stamens.

32. PIPER VARIBRACTEUM C. DC. Text fig. 36.

Piper varibracteum C. DC. in Leafl. Philip. Bot. 3 (1910) 764, Philip. Journ. Sci. 5 (1910) Bot. 421, 11 (1916) Bot. 208, Candollea 1 (1923) 182; MERR., Enum. Philip. Fl. Pl. 2 (1923) 16.

Piper striatum C. DC. in Leafl. Philip. Bot. 3 (1910) 776, Philip. Journ. Sci. 5 (1910) Bot. 441, Candollea 1 (1923) 279; MERR., Enum. Philip. Fl. Pl. 2 (1923) 15; non Vahl (1804) nec C. DC. (1871–73).

Piper maincaw C. DC. in Candollea 1 (1923) 209.

A diœcious vine; the branches glabrous, terete, 1.25 to 2 mm in diameter. Leaves chartaceous to subcoriaceous, elliptic-ovate, 6 to 8.2 cm long, 3 to 4.5 cm wide, base subinequilaterally acute,

FIG. 36. *Piper varibracteum* C. DC.; *1–2*, leaves, × 0.5; *3*, leaf and mature pistillate spike, × 0.5; *4*, top view of pistillate bracts, × 7.5; *5*, top view of a fruit, × 7.5; *6*, side view of a fruit, × 7.5; *7*, fruit embedded in the rachis, × 7.5; *8*, portion of the staminate spike, × 10; *9*, stamens, × 10.

5-nerved to 5-plinerved, apex shortly and obtusely, obscurely acuminate, glabrous on both surfaces, reticulations more or less prominent on both surfaces; petioles glabrous, 1.5 to 2.5 cm long in the female, 2.5 to 8 mm long in the male. Pistillate spikes abbreviated, ovoid, 0.8 to 1 cm long, 5 to 7 mm in dia-

meter; the peduncles glabrous, 1 to 1.3 cm long; rachis sparsely pilose; bracts sessile, peltate, disk glabrous, suborbicular, 0.75 to 1 mm wide; fruits free only at the apex, globose, 2.25 to 2.5 mm long, 2.5 to 3 mm in diameter; stigmas 4, distant, free, ovoid, acute, sessile, apical. Staminate spikes 3.5 to 6 cm long, 1.5 to 2 mm in diameter; the peduncles glabrous, 10 to 14 mm long; rachis sparsely pilose; bracts sessile, peltate, disk glabrous, somewhat fleshy, rounded-obovate to orbicular, 0.75 to 1 mm wide; stamens 2, pedicellate, 0.75 to 1 mm long, anthers globose, tetralocular, 4-valved, filaments oblong.

MINDANAO, Davao Province, Mount Apo, *Elmer 11998* (type collection of *Piper varibracteum* C. DC.), *11764* (type collection of *Piper striatum* C. DC.), *11162*. In forests at medium altitudes. Endemic.

Local names: Manikatápi, miaukau (Bag.).

A species belonging in the group with *Piper delicatum* C. DC. but near *Piper curtifolium* C. DC., differing from the latter by its larger leaves, globose fruits, variable bracts, and pedicellate stamens.

33. PIPER MINDORENSE C. DC. Text fig. 37.

Piper mindorense C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 423, Candollea 1 (1923) 183; MERR., Enum. Philip. Fl. Pl. 2 (1923) 12.

A dicœcious vine; the young branches densely hirtellous, the older ones glabrous, 1.25 to 2 mm in diameter. Leaves chartaceous, ovate, 4.5 to 5.5 cm long, 3 to 3.5 cm wide, base equilaterally rounded, 7-nerved, apex shortly and acutely acuminate, glabrous and dark brown above, conspicuously and densely hirtellous on the nerves beneath, reticulations obscure above, prominent beneath; petioles hirtellous, 5 to 10 mm long. Pistillate spikes abbreviated, subglobose, about 1 cm long, 0.7 cm in diameter; the peduncles hirtellous, 5 to 6 mm long; rachis puberulent; bracts sessile, peltate, disk glabrous, orbicular, about 0.75 mm wide; fruits free only at the apex, ellipsoid, umbonate,

FIG. 37. *Piper mindorense* C. DC.; *1*, leaf, × 0.5; *2*, top and side views of pistillate bracts, × 7.5; *3*, fruit, × 7.5; *4*, seeds, × 8.

about 2.5 mm long, 1.75 mm in diameter; stigmas 3, oblong, sessile, apical; seeds subglobose to elliptic-ovoid, about 2.25 mm. long, apex conspicuously umbonate.

MINDORO, Mount Halcon, *For. Bur. 4474 Merritt* (type in herb. Manila). Endemic.

This species most nearly approaches *Piper curtifolium* C. DC., but differs in many respects; for instance, in its ovate leaves, with rounded bases, its hirtellous nerves, its ellipsoid fruits, and its conspicuously umbonate seeds.

34. PIPER OVATIBACCUM C. DC. Text fig. 38; Plate 17, fig. 7.

Piper ovatibaccum C. DC. in Leafl. Philip. Bot. 3 (1910) 782, Philip. Journ. Sci. 5 (1910) Bot. 445 (incl. forma *b* C. DC.), 11 (1916) Bot. 220, Candollea 1 (1923) 205; MERR., Enum. Philip. Fl. Pl. 2 (1923) 13.

Piper robinsonii C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 445, Candollea 1 (1923) 206; MERR., Enum. Philip. Fl. Pl. 2 (1923) 13.

A dicœcious vine; the branchlets villose, terete, the branches glabrous, 1.25 to 2.5 mm in diameter, lenticels prominent. Leaves membranaceous to chartaceous, with brown dots beneath, narrowly elliptic-lanceolate to ovate, 5.5 to 13 cm long, 1.2 to 6.4 cm wide, base subequilaterally acute to obtuse, 5- to 7-plinerved, apex acutely acuminate, pilose on both surfaces, reticulations somewhat obscure above, prominent beneath; petioles pilose to densely pilose, 5 to 15 mm long, in the lower leaves up to 45 mm long. Pistillate spikes abbreviated, oblong, 1 to 2.2 cm long, 6 to 10 mm in diameter; the peduncles glabrous or sparingly pilose, 3 to 8 mm long; rachis pilose; bracts sessile, peltate, disk glabrous, orbicular, about 0.75 mm wide; fruits free, base partly embedded in and concrescent with the rachis, oblong-obovoid to obovoid, subacute, 2.75 3.25 mm long, 1.75 to 2.25 mm in diameter; stigmas 3, ovoid, acute, sessile, apical; seeds glabrous, oblong to obovoid, subacute, 2.5 to 3 mm long. Staminate spikes suberect, usually curved at the apex, 3.5 to 6.5 cm long, 1.25 to 2 mm in diameter; the peduncles glabrous or sparsely pilose, 2 to 6 mm long; rachis densely pilose; bracts sessile, peltate, disk glabrous, orbicular, 0.6 to 0.75 mm wide; stamens 2, sessile, anthers ovoid, 2-valved.

LUZON, Rizal Province, Mount Irig, *Bur. Sci. 41998 Ramos;* Balacbac, *Loher 13079:* Laguna Province, Santa Maria, *Bur. Sci. 42519 Taguibao;* Paete, *For. Bur. 26798 Mabesa, Baker 3165;* San Antonio, *Philip. Pl. 1101 Ramos, Bur Sci. 16643,*

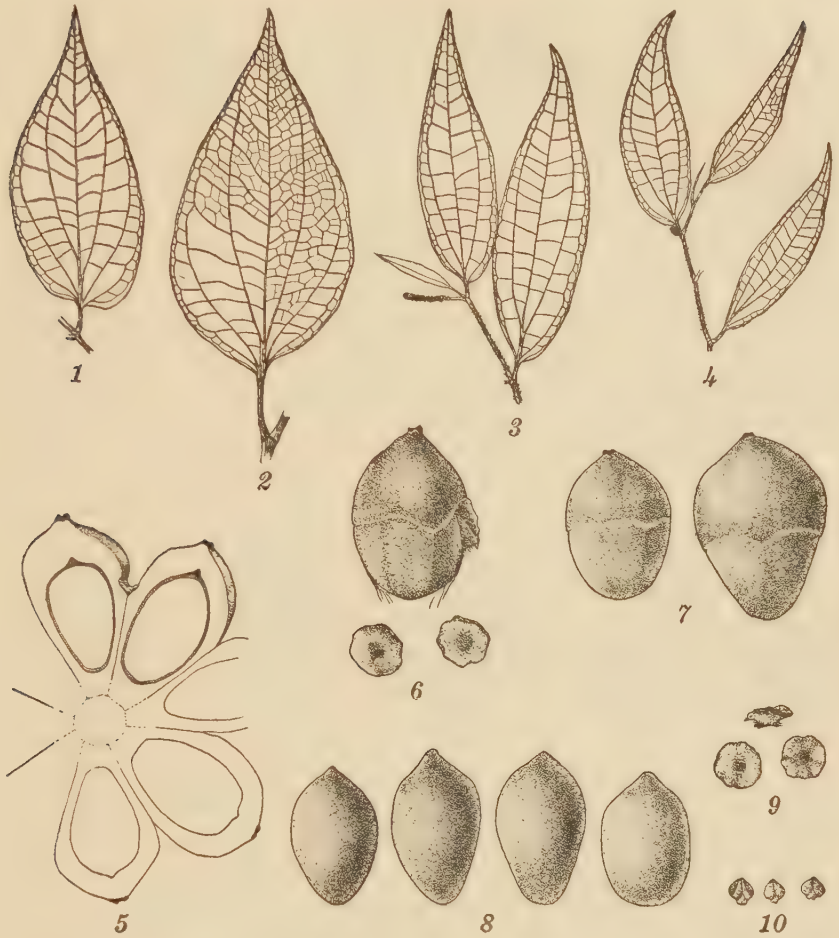

FIG. 38. *Piper ovatibaccum* C. DC.; *1–2*, leaves, × 0.5; *3*, branchlet with young staminate spike, × 0.5; *4*, branchlet with young pistillate spike, × 0.5; *5*, portion of the transverse section of a mature pistillate spike, × 7.5; *6*, fruit with bract attached and top view of pistillate bracts, × 7.5; *7*, fruits, × 7.5; *8*, seeds, × 7.5; *9*, side and top views of staminate bracts, × 10; *10*, stamens, × 10.

20123, 20418, 20486 Ramos; Mount Banahao, *Bur. Sci. 6065* (type of *Piper robinsonii* C. DC. in herb. Manila), *6089, 9755, 9759 Robinson, 2460 Foxworthy, For. Bur. 8016 Curran and Merritt, Quisumbing 1253, 1280, Calvin 316, Juliano 1086a:* Tayabas Province, Lucban, *Elmer 7888* (type collection of *Piper ovatibaccum* C. DC.); Infanta, *Bur. Sci. 9355 Robinson;* Mount Binuang, *Bur Sci. 28772 Ramos and Edaño:* Camarines Province, Mount Bagacay, *Bur. Sci. 33860 Ramos and Edaño:* Sor-

sogon Province, Mount Kililibong, *Bur. Sci. 23510 Ramos.* CATANDUANES, Mount Mareguidon, *Bur. Sci. 30516 Ramos.* MINDORO, Mount Halcon, *Merrill 5645, Bur. Sci. 40729 Ramos and Edaño.* PANAY, Capiz Province, Jamindan, *Bur. Sci. 31218 Ramos and Edaño.* LEYTE, Dagami, *Bur. Sci. 15363 Ramos;* Jaro, Buenavista, *Wenzel 524, 590, 602, 636, 735, 960, 982, 1114, 1115, 1162.* MINDANAO, Agusan Province, Cabadbaran, Mount Urdaneta, *Elmer 13687:* Bukidnon Province, Kabaritan, *Rola 68;* Mount Dalirig, *Bur. Sci. 21446 Escritor;* Mount Candoon, *Bur. Sci. 38776 Ramos and Edaño;* Agusan River, near Tangkulan, *Bur. Sci. 39104 Ramos and Edaño:* Lanao Province, Lake Lanao, Camp Keithley, *Clemens s. n.* In forests at medium altitudes, ascending to 1,075 meters. Endemic.

Local names: Búyo-háyo (P. Bis.); dumá-dínayan (Lan.); litlít (Tag.); litlít-matsíng (Tag.); mapoua (Buk.).

The species in its inflorescence and form of the leaves resembles *Piper halconense* C. DC., but differs in the conspicuous pubescence on its vegetative organs and in its ovoid anthers.

35. **PIPER RAMOSII** C. DC. Text fig. 39.

Piper ramosii C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 426, 11 (1916) Bot. 211, Candollea 1 (1923) 206; MERR., Enum. Philip. Fl. Pl. 2 (1923) 14.

A dicœcious vine; the branchlets densely hirsute, older branches glabrous, terete, pale when dry, 1.5 to 2.5 mm in diameter. Leaves membranaceous to chartaceous, narrowly oblong-ovate to ovate-lanceolate, 6.5 to 12 cm long, 1.5 to 3 cm wide, base inequilaterally cordate-auriculate, 5- to 7-plinerved, apex narrowed, acute, hirtellous on both surfaces, reticulations more or less prominent beneath; petioles densely hirsute, 2 to 6 mm long, in the lower leaves up to 20 mm long. Pistillate spikes suberect, somewhat abbreviated, oblong, 1.5 to 2 cm long, 6 to 10 mm in diameter; the peduncles hirsute, 4 to 6 mm long; rachis hirsute; bracts subsessile, peltate, disk glabrous, nearly orbicular to ovate, about 1 mm wide, pedicel hirsute; fruits with base partly embedded in and concrescent with the rachis, glabrous, angled, obovoid, 3.5 to 4 mm long, 2.5 to 3 mm in diameter; stigmas 3, linear, acute, sessile, apical; seeds obovoid, 3 to 3.5 long. Staminate spikes 3 to 4.5 cm long, 1.5 to 2 mm in diameter; the peduncles hirsute, 5 to 7 mm long; rachis hirsute; bracts subsessile or sessile, peltate, disk glabrous, orbicular, about 0.5 mm wide; stamens 2, sessile, anthers small, reniform, tetralocular, 2-valved.

FIG. 39. *Piper ramosii* C. DC.; *1–3*, leaves, × 0.5; *4*, mature pistillate spike, × 0.5; *5*, top and side views of pistillate bracts, × 7.5; *6*, fruits, × 7.5; *7*, seeds, × 7.5; *8*, staminate spike, × 0.5; *9*, side view of staminate bract, × 40; *10*, top and side views of stamens, × 40.

LUZON, Rizal Province, Bosoboso, *Bur. Sci. 1755 Ramos* (type collection); San Isidro, *Bur. Sci. 13397, 24932 Ramos;* Antipolo, *Bur. Sci. 22279 Ramos;* San Andales, *Bur. Sci. 19149 Reillo;* Mount Lumutan, *Bur. Sci. 29779, 29645 Ramos and Edaño;* Montalban, *Loher 12099, 12137.* In forests at low and medium altitudes. Endemic.

This species is nearest to *Piper ovatibaccum* C. DC., but differs conspicuously in its auriculate leaves and reniform anthers.

36. PIPER FUSCINERVUM sp. nov. Text fig. 40; Plate 7.

Frutex dioicus, scandens; ramulis fuscis, nigrescentibus, junioribus dense hirsutis, vetustioribus glabris, 1.5 ad 3 mm diametro; foliis membranaceis ad subchartaceis, oblongo-ovatis ad ovatis, 7.5 ad 12 cm longis, 3.5 ad 4.5 cm latis, basi inequilateralibus, cordatis-auriculatis, 5- to 7-plinerviis, apice acute

acuminatis, utrinque hirtellis, fuscis, nigrescentibus; petiolo 4 ad 9 mm longo, dense hirsuto; spicis ♀ subabbreviatis, oblongis, 1.5 ad 2 cm longis, 6 ad 7 mm diametro; pedunculis hirsutis, 10 ad 18 mm longis; bracteis sessilibus, peltatis, peltis orbicularis, glabris; baccis liberis, partim immersis, globoso-ovoideis, 2 ad 2.25 mm longis, 1.75 ad 2 mm diametro; stigmatibus 3 vel 4, ovoideis, acutis, sessilibus; spicis ♂ erectis, 2.5 ad 4 cm longis, 1 ad 1.25 mm diametro; pedunculis glabris; rachis hirsutis; bracteis sessilibus, peltatis, peltis orbicularis, glabris; staminibus 2, antheris reniformibus, 2-valvatis.

FIG. 40. *Piper fuscinervum* sp. nov.; *1*, leaf, × 0.5; *2*, mature pistillate spike, natural size; *3*, top and side views of staminate bracts, × 10; *4*, fruit, × 10; *5*, top and side views of pistillate bracts, × 10; *6*, stamens, × 40.

A dicœcious vine; the branchlets densely hirsute, the older branches glabrous, terete, brown to black when dry, 1.5 to 3 mm in diameter. Leaves membranaceous to subchartaceous, with minute black dots beneath, oblong-ovate to ovate, 7.5 to 12 cm long, 3.5 to 4.5 cm wide, base inequilaterally cordate-auriculate, 5- to 7-plinerved, apex acutely acuminate, hirtellous on both surfaces, reticulations black, prominent beneath; petioles densely hirsute, 4 to 9 mm long, in the lower leaves up to 23 mm long. Pistillate spikes somewhat abbreviated, oblong, 1.5 to 2 cm long, 6 to 7 mm in diameter; the peduncles hirsute, 10 to 18 mm long; rachis hirsute; bracts sessile, peltate, disk, glabrous, orbicular, about 1 mm wide; fruits partly embedded in

and concrescent with the rachis, red, glabrous, globose-ovoid, 2 to 2.25 mm long, 1.75 to 2 mm in diameter; stigmas 3 or 4, ovoid, acute, sessile, apical. Staminate spikes 2.5 to 4 cm long, 1 to 1.25 mm in diameter; the peduncles glabrous, 6 to 8 mm long; rachis hirsute; bracts sessile, peltate, disk glabrous, orbicular, 0.5 to 0.75 mm wide; stamens 2, sessile, anthers small, reniform, bilocular, 2-valved.

PANAY, Capiz Province, Mount Madiias, *Bur. Sci. 30660, 30663, 30664, 30691 Ramos and Edaño;* Jamindan, *Bur. Sci. 30980, 31218 Ramos and Edaño;* Libacao, *Bur. Sci. 35324, 35345, 35380* (type in herb. Manila), *35510 Martelino and Edaño;* Mount Bulinao, *Bur. Sci. 35750 Martelino and Edaño.* MINDANAO, Bukidnon Province, Sumilao, *Bur. Sci. 15788 Fénix;* Tangkulan, *Bur. Sci. 39104 Ramos and Edaño.* In forests at low and medium altitudes.

Local name Tagpúan (Buk.).

Without doubt a species allied to *Piper ramosii* C. DC., but with much larger leaves and longer peduncles, which are usually brown to black.

37. PIPER BETLE Linn. **Text figs. 41 and 42; Plate 17, fig. 8.**

Piper betle LINN., Sp. Pl. (1753) 28, ed. 2 (1762) 40; BLANCO, Fl. Filip. (1837) 22, ed. 2 (1845) 16, ed. 3, 1 (1877) 30, *t. 12;* F.-VILL., Novis. App. (1880) 175; C. DC., Prodr. 16[1] (1869) 359, Philip. Journ. Sci. 5 (1910) Bot. 431 (incl. formæ *b* and *c* C. DC.), 11 (1916) Bot. 215, Leafl. Philip. Bot. 3 (1910) 447, Candollea 1 (1923) 187, 189, 195; MERR., Fl. Manila (1912) 170, Sp. Blancoanae (1918) 119, Enum. Philip. Fl. Pl. 2 (1923) 4.

Piper siriboa LINN., Sp. Pl. ed. 2 (1762) 41; BLUME, Verh. Bat. Genoots. 11 (1826) 208, *t. 24.*

Chavica siriboa MIQ., Syst. Pip. (1843) 224, Fl. Ind. Bat. 1[2] (1858–59) 438.

Piper anisumolens BLANCO, Fl. Filip. (1837) 23; HASSK., Flora 47 (1864) 59.

Piper anisodorum BLANCO, Fl. Filip. ed. 2 (1845) 16, ed. 3 1 (1877) 31, *t. 362.*

Chavica betle MIQ., Syst. Pip. (1843) 228, Fl. Ind. Bat. 1[2] (1858–59) 439.

Piper philippinense C. DC., Prodr. 16[1] (1869) 353; F.-VILL., Novis. App. (1880) 175; VIDAL, Phan. Cuming. Philip. (1885) 138, Rev. Pl. Vasc. Filip. (1886) 219.

Piper bathycarpum C. DC. in Perk. Frag. Fl. Philip. (1905) 153, Philip. Journ. Sci. 5 (1910) Bot. 434, Candollea 1 (1923) 208.

Piper blancoi MERR. in Philip. Journ. Sci. 1 (1906) Suppl. 40.

Piper puberulinodum C. DC. in Leafl. Philip. Bot. 3 (1910) 773, Philip. Journ. Sci. 5 (1910) Bot. 429, Candollea 1 (1923) 187; MERR., Enum. Philip. Fl. Pl. 2 (1923) 14.

Piper carnistylum C. DC. in Leafl. Philip. Bot. 3 (1910) 774, Philip. Journ. Sci. 5 (1910) Bot. 432, Candollea 1 (1923) 240; MERR., Enum. Philip. Fl. Pl. 2 (1923) 6.

A dicœcious vine; the branches glabrous, terete, 2.5 to 5 mm in diameter. Leaves chartaceous to subcoriaceous, upper leaves

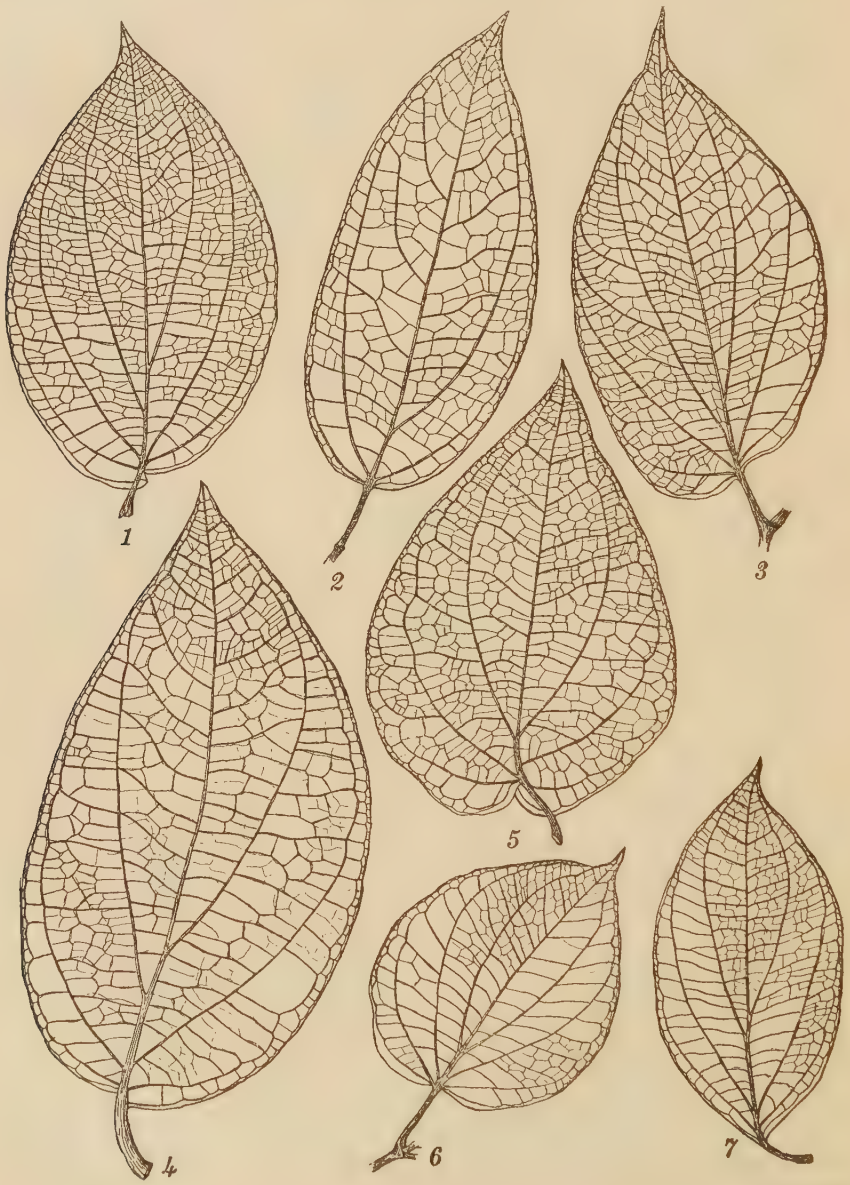

FIG. 41. Leaves of: *3–5*, *7*, *Piper betle* Linn.; *1*, var. *densum* (Blume) C. DC.; *2*, var. *macgregorii* (C. DC.) comb. nov.; *6*, var. *fenixii* (C. DC.) comb. nov. All × 0.5.

usually oblong-elliptic, oblong-ovate, or ovate, the lower ones usually ovate to rounded-ovate, 6 to 17.5 cm long, 3.5 to 10 cm wide, in the lower leaves up to 12 cm wide, base equilaterally to inequilaterally obtuse to rounded, rarely acute or subacute, in the lower leaves usually equilaterally subcordate or cordate, 7-plinerved, apex acutely acuminate or narrowed acute, glabrous

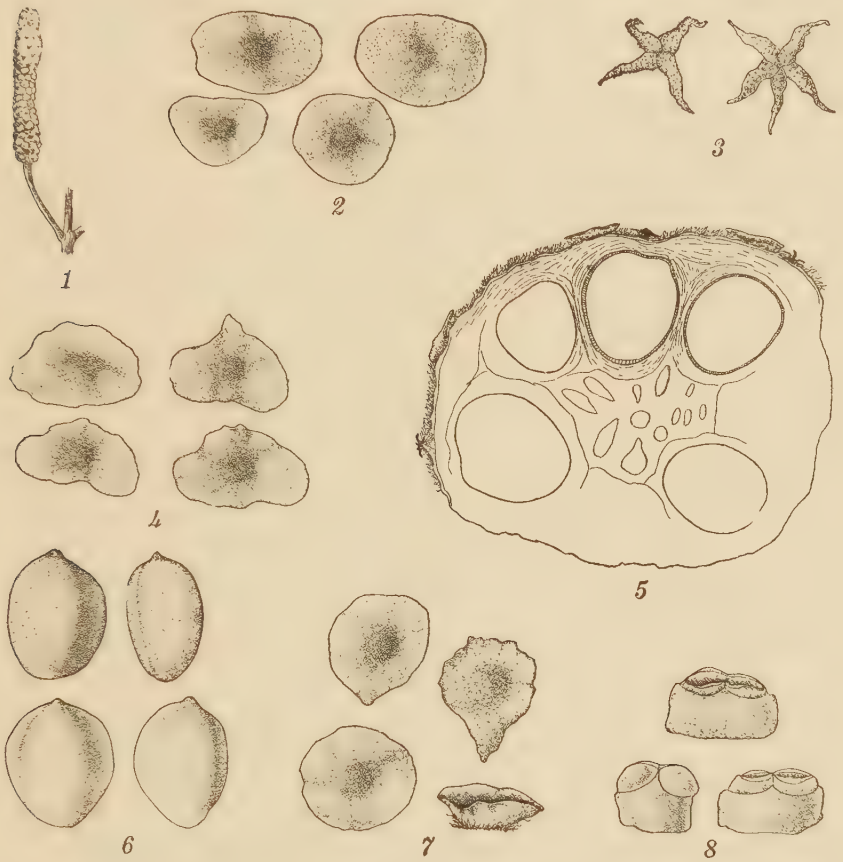

FIG. 42. *Piper betle* Linn.; *1*, mature pistillate spike, × 0.5; *2*, top view of pistillate bracts, × 10; *3*, stigmas, × 10; *4*, top view of pistillate bracts (var. *densum*), × 10; *5*, transverse section of a mature pistillate spike, × 7.5; *6*, seeds, × 7.5; *7*, top and side views of staminate bracts, × 10; *8*, stamens, × 10.

on both surfaces, reticulations somewhat obscure in the young leaves, prominent in the mature beneath; petioles glabrous, 10 to 20 mm long, in the lower leaves up to 40 mm long. Pistillate spikes oblong to elongated oblong, 3 to 8 cm long, 0.6 to 1 cm in diameter; the peduncles glabrous, 1.5 to 3.5 cm long; rachis hirsute to densely hirsute; bracts sessile, peltate, disk glabrous,

transversely oblong to suborbicular, about 1 mm wide; fruits coalescing, fully embedded in the pulp and concrescent with the rachis; seeds oblong to globose-obovoid, 2.25 to 2.6 mm long, about 2 mm in diameter, glabrous; stigmas 4 to 6, rarely 3, lanceolate, acute, up to 0.6 mm long, sessile, apical. Staminate spikes subpendulous, slender, 7 to 13.5 cm long, 2 to 3.5 mm in diameter; the peduncles glabrous, 1.5 to 3.8 cm long; rachis hirsute; bracts sessile, peltate, disk glabrous, obovate to orbicular, 1 to 1.3 mm wide; stamens 2, pedicellate, 0.75 to 1 mm long, anthers reniform, tetralocular, 2-valved, dehiscence apical, 0.6 to 1 mm wide, filaments oblong, stout, as long as the anthers or slightly longer.

LUZON, Isabela Province, Maluno, *Warburg 11928:* Nueva Viscaya Province, Dupax, *Bur. Sci. 11221, 14179, 11409, 11441, 11500, 14172 McGregor:* Lepanto Subprovince, Cervantes, *Vanoverbergh 2123;* without definite locality, *Bona 400:* Pangasinan Province, San Quintin, *Antonio 5607,* some of the lower leaves of this specimen may be mistaken for those of *Piper longum* Linn.: Bulacan Province, Norzagaray, *Bur. Sci. 13031 Ramos;* Angat, *Bur. Sci. 21749 Ramos;* Galas, *Bur. Sci. 24733 Leuterio:* Bataan Province, Lamao River, Mount Mariveles, *Williams 511, Whitford 188, Merrill 2526, 3781;* Bamban, *For. Bur. 23212 Alhambra and Canlas;* Dinalupihan, *Merrill 1561:* Rizal Province, Mendez, *Bur. Sci. 1314 Mangubat;* Morong, *Bur. Sci. 1368 Ramos;* Antipolo, *Bur. Sci. 13524 Ramos, Merr. Sp. Blancoanae 788, 835:* Cavite Province, Alfonso, *Bur. Sci. 22549 Ramos and Deroy:* Laguna Province, San Antonio, *Bur. Sci. 16639, 20528 Ramos;* Paete, *Bur. Sci. 27864, 27886 McGregor;* Los Baños, *Bur. Sci. 9689, 17289 Robinson, Holman 190, Baker 972, 851, Asuncion 5390, Elmer 17579, 18230;* Mount San Cristobal, *Miras 6418;* Calauan, *Cuming 485* (type collection of *Piper philippinense* C. DC.): Tayabas Province, Lucban, *Elmer 8094* (type collection of *Piper carnistylum* C. DC.); Guinayangan, *Bur. Sci. 20867 Escritor;* Mount Binuang, *Bur. Sci. 28837 Ramos and Edaño;* Umiray, *Bur. Sci. 28970 Ramos and Edaño;* Casiguran, *Bur. Sci. 45356 Ramos and Edaño:* Camarines Sur Province, Sagnay, *Bur. Sci. 22134 Ramos;* Camaligan, *Piper 94.* ALABAT, *Bur. Sci. 48244 Ramos and Edaño.* MINDORO, Pinamalayan, *Bur. Sci. 40905 Ramos.* LEYTE, Dagami, *Wenzel 23, 486;* Tigbao, *Wenzel 1544.* BOHOL, Sevilla, *Bur. Sci. 42785 Ramos.* MINDANAO, Surigao Province, Surigao, *Bur. Sci. 34373 Ramos and*

Pascasio; Placer, *Wenzel 2655:* Agusan Province, Cabadbaran, Mount Urdaneta, *Elmer 13554 :* Davao Province, Todaya, Mount Apo, *Elmer 11972* (type collection of *Piper puberulinodum* C. DC.) ; Mati, *Bur. Sci. 49239 Ramos and Edaño.* JOLO, *Warburg 14844* (type of *Piper bathycarpum* C. DC.), *Bur. Sci. 44457 Ramos and Edaño.* TAWITAWI, *Bur. Sci. 44114 Ramos and Edaño.* The betle pepper, cultivated throughout the Philippines, also found wild. Malaya to India, planted in other tropical countries.

Local names: Buyo (Bik.) ; buyo-anís (Tag.) ; buyo de anis (Sp.) ; buyo-búyo (Bik.) ; buyog (Mbo.) ; buyok (C.Bis.) ; buyu (Sul.) ; gáoed (Pang.) ; gáued (It.) ; gók (Ibn.) ; íkmo (Tag.) ; íkmong-ilóko (Tag.) ; ítmo (Tag.) ; kanisi (Bis.) ; mamin (Bis., Tag.) ; mamon (Bis.) ; samát (Pamp.) ; samog (Ilk.).

The species is characterized by its unique pistillate spikes and by its upper leaves being usually oblong-elliptic, oblong-ovate, or ovate and the lower ones usually ovate to rounded-ovate. The fruits in these spikes are coalesced, fully embedded in the pulp, and concrescent with the rachis.

Var. FENIXII (C. DC.) comb. nov.

Piper fenixii C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 425, Candollea 1 (1923) 187; MERR., Enum. Philip. Fl. Pl. 2 (1923) 8.

Leaves rounded-ovate, 7 to 12 cm long, 5.5 to 10 cm wide, shortly and acutely acuminate, base rounded to cordate.

BATAN, Batanes Province, Santo Domingo de Basco, *Bur. Sci. 3652 Fénix* (type collection). LUZON, Ilocos Norte Province, Burgos, *Bur. Sci. 32896 Ramos.* Endemic.

Common name: Samoy (Bat.)

This differs from the species only in that the leaves are all rounded-ovate with bases rounded to cordate.

Var. MACGREGORII (C. DC.) comb. nov.

Piper macgregorii C. DC. in Philip. Journ. Sci. 11 (1916) Bot. 215, Candollea 1 (1923) 189; MERR., Enum. Philip. Fl. Pl. 2 (1923) 11.

Leaves including the basal ones oblong or oblong-elliptic, 12 to 18 cm long, 4.5 to 8 cm wide, base acute to obtuse, apex obscurely and acutely acuminate; peduncles 3 to 3.5 cm long.

BILIRAN, *Bur. Sci. 18491* (type collection), *18991 McGregor.* In forests, altitude about 300 meters. Endemic.

This differs from the species in that the upper and lower leaves are all oblong or oblong-elliptic.

Var. DENSUM (Blume) C. DC.

Piper betle LINN. var. *densum* (Blume) C. DC., Prodr. 16[1] (1869) 360, Candollea 1 (1923) 237.
Piper densum BLUME, in Verh. Bat. Genoots. 11 (1826) 193, *t. 18.*
Chavica densa MIQ., Syst. Pip. (1843) 252, Nov. Act. Acad. Nat. Cur. 21 (1846) Suppl. 37, *t. 32.*
Piper canaliculatum OPIZ in Presl Rel. Haenk. 1 (1828) 156; MIQ., Syst. Pip. (1843) 336.
Piper malarayatensis C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 442, Candollea 1 (1923) 200; MERR., Enum. Philip. Fl. Pl. 2 (1923) 11.

Lamina glabrous above, pubescent on the nerves beneath.

LUZON, without definite locality or province, *Haenke s. n.* (type of *Piper canaliculatum* Opiz in herb. Prague): Batangas Province, Mount Malarayat, *Copeland s. n.* (type of *Piper malarayatensis* C. DC. in herb. Manila). JOLO, *Bur. Sci. 44422 Ramos and Edaño.* India to Java and Borneo.

The variety is identical with the species in all respects except that the leaves are pubescent on the nerves beneath.

38. PIPER LANGLASSEI C. DC. Text fig. 43.

Piper langlassei C. DC. in Ann. Conserv. Jard. Bot. Genéve 2 (1898) 273, Philip. Journ. Sci. 5 (1910) Bot. 433, Candollea 1 (1923) 182, 194; MERR., Enum. Philip. Fl. Pl. 2 (1923) 10.

A dicœcious vine; the branches glabrous, terete, 1.5 to 2.5 mm in diameter, divaricate, somewhat fragile. Leaves chartaceous, subovate-elliptic, 5 to 7 cm long, 2 to 3.8 cm wide, base inequilaterally acute, 7-plinerved, apex acute, glabrous on both surfaces, pale when dry, reticulations somewhat obscure on both surfaces; petioles glabrous, 2.5 to 4 mm long. Pistillate spikes oblong, elongated, 2.5 to 3 cm long, 7 to 8 mm in diameter; the peduncles glabrous, 1.5 to 1.8 cm long; rachis pilose; bracts sessile, peltate, disk glabrous, subelliptic, about 0.75 mm long, 0.5 mm wide; fruits coalescing, fully embedded in the pulp, oblong-obovoid to subglobose, 2.5 to 3 mm long, 2 to 2.25 mm in diameter; stigmas 3 to 5, sessile, apical, confluent.

LUZON, at the foot of Mount Banahao, *Langlasse 97* (type in herb. de Candolle; isotypes in herb. Paris Museum and in herb. Manila).

This species has the vegetative appearance of *Piper varibracteum* C. DC., differing conspicuously in its pistillate spikes, in which the fruits are coalesced and fully embedded in the pulp. In this respect it is allied to *Piper betle* Linn., differing from this in its smaller, subovate-elliptic leaves with inequilaterally acute bases and confluent stigmas.

FIG. 43. *Piper langlassei* C. DC.; *1*, fruiting branch, × 0.5; *2*, longitudinal section of a portion of the pistillate spike, × 7; *3*, bracts, × 7; *4*, stigmas, × 7.

39. PIPER ASTEROSTIGMUM sp. nov. Text fig. 44; Plate 8.

Frutex dioicus, scandens, ramis glabris, subteretibus, 3 ad 6 mm diametro; foliis oblongo-ovatis, 8 ad 12.5 cm longis, 4 ad 6 cm latis, basi subinaequilateralibus, obtusis, 7-plinerviis, apice acute acuminatis, coriaceis, utrinque glabris; spicis ♀

oblongo-ovoideis ad oblongo-obovoideis, 3.5 ad 3.8 cm longis, 1.5 ad 1.7 cm diametro; pedunculis 4 ad 6.5 cm longis; rachis dense pubescentibus; bracteis sessilibus, peltatis, peltis carnosis, glabris, triangularis, circiter 1.5 mm latis; baccis profunde immersis; seminibus glabris, laevis, oblongis ad oblongo-ovoideis, 3 ad 3.25 mm longis; stigmatibus 4 ad 6, plerumque 5, stellatis.

A dicœcious vine; the branches glabrous, subterete, smooth, 3 to 6 mm in diameter. Leaves firmly coriaceous, oblong-ovate, 8 to 12.5 cm long, 4 to 6 cm wide, base subinequilaterally obtuse, 7-plinerved, apex acutely acuminate, glabrous on both surfaces, shining above, pale, the nerves conspicuously sunken above, reticulations somewhat obscure; petioles glabrous, 1.5 to 2.5 cm long. Pistillate spikes oblong-ovoid to oblong-obovoid, 3.5

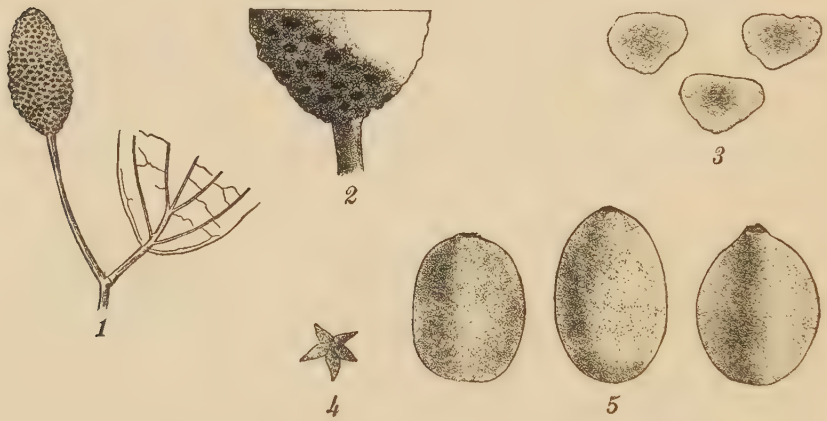

FIG. 44. *Piper asterostigmum* sp. nov.; *1*, mature pistillate spike and base of a leaf, × 0.5; *2*, portion of the mature pistillate spike, enlarged; *3*, top view of bracts, × 7.5; *4*, stigmas, × 7.5; *5*, seeds, × 7.5.

to 3.8 cm long, 1.5 to 1.7 cm in diameter; the peduncles glabrous, 4 to 6.5 cm long; rachis densely pubescent with short, soft hairs; bracts sessile, peltate, disk glabrous, fleshy, triangular, 1 to 1.25 mm long, about 1.5 mm wide; fruits fully embedded in the pulp; seeds glabrous, smooth, oblong to oblong-ovoid, 3 to 3.25 mm long, 2 to 2.1 mm in diameter; stigmas 4 to 6, usually 5, sessile, conspicuously stellate, up to 0.75 mm in length.

MINDANAO, Surigao Province, Placer, *Wenzel 3121* (type in herb. University of California; isotype in herb. Manila), September 5, 1927, in forests, altitude about 150 meters.

A species closely allied to *Piper betle* Linn., differing in its broader spikes, longer peduncles, conspicuously white and stel-

late stigmas, and its firmly coriaceous leaves with sunken nerves above.

40. PIPER FIRMOLIMBUM C. DC. Text figs. 45 and 46; Plate 19.

Piper firmolimbum C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 435, Candollea 1 (1923) 188; MERR., Enum. Philip. Fl. Pl. 2 (1923) 9.

A dicœcious vine; the branchlets sometimes hirsute, the branches glabrous, terete, 1.5 to 3 mm in diameter. Leaves firm, chartaceous to subcoriaceous, elliptic-lanceolate to oblong-

FIG. 45. *Piper firmolimbum* C. DC.; *1, 3–4*, leaves, × 0.5; *2*, fruiting branch with mature pistillate spike, × 0.5; *5*, var. *parvilimbum* var. nov., leaf, × 0.5.

ovate, 11 to 16.5 cm long, 4 to 5.5 cm wide, in the lower leaves up to 10 cm wide, base equilaterally to subequilaterally acute to subrounded, 7-plinerved, apex shortly and acutely acuminate to acutely acuminate, glabrous and shining above, glabrous to sparsely hirsute on the nerves beneath, nerves sunken above, reticulations more or less distinct on both surfaces; petioles glabrous to hirsute, 10 to 22 mm long. Pistillate spikes oblong, 2.2 to 5.3 cm long, 9 to 10 mm in diameter; the peduncles gla-

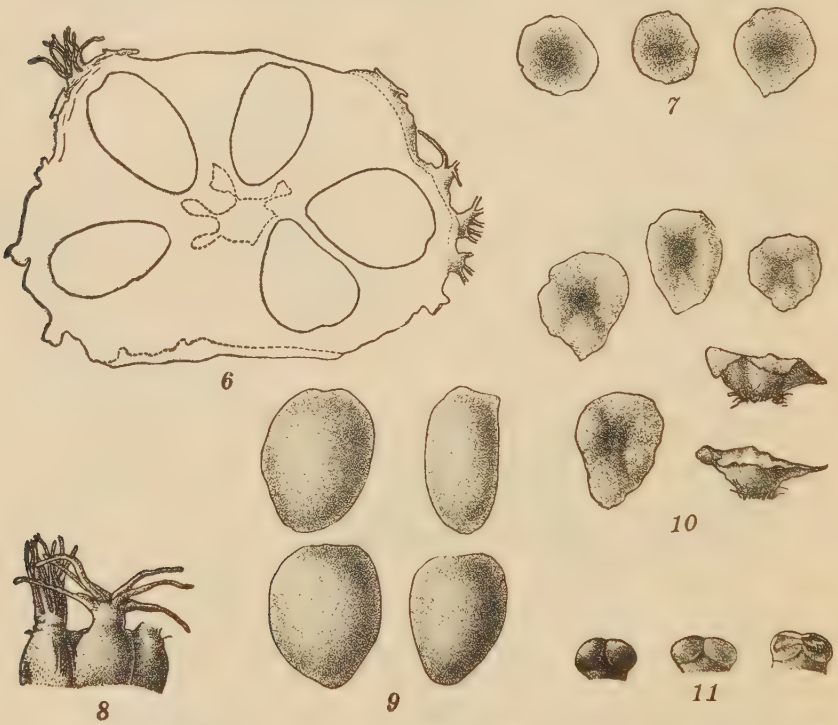

FIG. 46. *Piper firmolimbum* C. DC.; *6*, transverse section of a mature pistillate spike, enlarged; *7*, top view of pistillate bracts, × 10; *8*, young fruits showing stigmas, × 10; *9*, seeds, × 7.5; *10*, top and side views of staminate bracts, × 10; *11*, stamens, × 10.

brous, 3 to 5.8 cm long; rachis hirsute; bracts sessile, peltate, disk glabrous, rounded-obovate to orbicular, 0.75 to 1 mm wide; fruits concrescent; seeds oblong to oblong-obovoid, apex usually truncate, 2.5 to 2.75 mm long, 1.25 to 2 mm in diameter; stigmas usually 6 or 8, rarely 4 or 5, elongated, 1 to 1.25 mm long, erect or curved, slender, puberulent. Staminate spikes pendulous, 6 to 11 cm long, about 2 mm in diameter; the peduncles glabrous, 2 to 3 cm long; rachis hirsute; bracts sessile, subimbricate, peltate, disk glabrous, fleshy, rounded-obovate to oblong-obovate, 1 to 1.5 mm long, about 1 mm wide; stamens 2, subsessile, anthers

reniform, 2-valved, dehiscence apical, filaments stout, very much shorter than the anthers.

LUZON, Laguna Province, Los Baños, Mount Maquiling, *Elmer 17985, 17706, 18190.* ALABAT, *Bur. Sci. 47974, 48198 Ramos and Edaño.* LEYTE, Tacloban, Tigbao, *Wenzel 1622.* MINDANAO, Lanao Province, Lake Lanao, Camp Keithley, *Clemens s. n.* (type in herb. Manila). In forests at low and medium altitudes. Endemic.

A species doubtless closely related to *Piper longistigmum* C. DC., but differing conspicuously in its vegetative characters, as for example the sunken nerves on the surface of the lamina.

Var. PARVILIMBUM var. nov.

Foliis ovatis, 6 ad 8 cm longis, 3 ad 4.5 cm latis.

Leaves ovate, 6 to 8 cm long, 3 to 4.5 cm wide, base obtuse to rounded.

LUZON, Sorsogon Province, Irosin, Mount Bulusan, *Elmer 14517* (type in herb. Manila), September, 1916.

This variety differs from the species in the size and form of its leaves.

41. PIPER LONGISTIGMUM C. DC. Text fig. 47.

Piper longistigmum C. DC. in Leafl. Philip. Bot. 3 (1910) 770, Philip. Journ. Sci. 5 (1910) Bot. 428, Candollea 1 (1923) 198; MERR., Enum. Philip. Fl. Pl. 2 (1923) 11.

A diœcious vine; the branches terete, glabrous, 1.5 to 4 mm in diameter. Leaves chartaceous, brown, lanceolate, 10.5 to 18.5 cm long, 3 to 5 cm wide, base equilaterally subacute to acute, 7-plinerved, apex narrowed, acute, glabrous on both surfaces, reticulations prominent on both surfaces; petioles glabrous, 10 to 20 mm long, in the lower leaves up to 30 mm long. Pistillate spikes oblong, 3 to 3.7 cm long, about 8 mm in diameter; the peduncles glabrous, 4.5 to 8 cm long; rachis glabrous; bracts sessile, peltate, disk suborbicular to orbicular, 1 to 1.25 mm wide; fruits concrescent, crowded; seeds oblong to oblong-obovoid, about 3 mm long, 1.75 to 2 mm in diameter; stigmas elongated, 4 or 5, rarely 3 or 6, erect to curved at the apex, slender, puberulent, 0.5 to 1.5 mm long.

LUZON, Tayabas Province, Lucban, *Elmer 7578* (type collection). CATANDUANES, Santo Domingo River, *Bur. Sci. 30493 Ramos.* In forests at low altitudes. Endemic.

A distinct species probably allied to *Piper betle* Linn., strongly characterized by its long slender stigmas which measure up to 1.5 mm in length and its lanceolate leaves.

FIG. 47. *Piper longistigmum* C. DC.; *1–2*, leaves, × 0.5; *3*, leaf and a mature pistillate spike, × 0.5; *4*, portion of the top view of a mature pistillate spike, × 7.5; *5*, side view of pistillate bracts, × 10; *6*, side view of a pistillate bract and a young fruit, × 10; *7*, top view of pistillate bracts, × 10; *8*, seeds, × 7.5.

42. PIPER BAGUIONUM C. DC. Text fig. 48; Plate 17, fig. 10.

Piper baguionum C. DC. in Leafl. Philip. Bot. 3 (1910) 775, Philip. Journ. Sci. 5 (1910) Bot. 434, Candollea 1 (1923) 214; MERR., Enum. Philip. Fl. Pl. 2 (1923) 4.

Piper polycladum C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 438, 11 (1916) Bot. 218, Candollea 1 (1923) 192; MERR., Enum. Philip. Fl. Pl. 2 (1923) 14.

A dicœcious vine; the branches glabrous, terete, 1 to 3 mm in diameter. Leaves subcoriaceous, ovate, 5.5 to 10.5 cm long,

2.5 to 5.9 cm wide, base equilaterally to subequilaterally acute to subrounded, 5- to 7-plinerved, apex acutely acuminate, glabrous on both surfaces, reticulations more or less prominent

FIG. 48. *Piper baguionum* C. DC.; *1*, fruiting branch, × 0.5; *2–3*, leaves, × 0.5; *4*, young pistillate spike, × 1.8; *5*, mature pistillate spike, × 0.5; *6*, top and side views of pistillate bracts, × 10; *7*, fruit, × 7.5; *8*, seeds, × 2.5; *9*, portion of staminate spike, × 7.5; *10*, side and top views staminate bracts, × 10; *11*, stamens, × 10.

beneath; petioles glabrous, 10 to 25 mm long, in the lower leaves up to 30 mm long. Pistillate spikes oblong-ovoid to broadly ovoid, 2 to 4.5 cm long, 1.6 to 2.5 cm in diameter; the peduncles glabrous, 1.5 to 2.5 cm long; rachis hirsute; bracts sessile, peltate, disk glabrous, elliptic to orbicular, 0.75 to 1 mm wide; fruits concrescent, crowded; seeds globose, umbonate, about 4 mm long, 4 mm wide, 2.5 to 3 mm thick; stigmas 3 or 4, short, erect, oblong, subacute; styles persistent, elongated, slender, about 1 mm long. Staminate spikes pendulous, 3 to 4.5 cm long, 3 to 3.5 mm in diameter; the peduncles glabrous, 12 to 20 mm long; rachis hirsute; bracts subsessile, peltate, disk glabrous, orbicular, about 1 mm wide, margins laciniate, pedicels stout, hirsute; stamens 2, pedicellate, about 1 mm long, anthers subglobose to ovoid, tetralocular, 4-valved, filaments oblong or swollen at the base, twice as long as the anthers, somewhat exerted.

LUZON, Benguet Subprovince, Baguio, *Elmer 8784* (type collection of *Piper baguionum* C. DC.), *5874, Williams 1134* (type of *Piper polycladum* C. DC. in herb. Manila), *Sandkuhl 156, Philip. Pl. 751 Merrill, Bur. Sci. 45086 Ramos and Edaño.* In thickets and forests, altitude about 1,500 meters. Endemic.

A species probably allied to *Piper betle* Linn., but clearly distinct. It is characterized by its rather large and broad, usually ovoid, pistillate spikes, large globose flattened fruits which are united and embedded in the rachis and its laciniate staminate bracts. There are two other species (*Piper angustipeltatum* Merr. and *Piper myrmecophilum* C. DC.) having fruits with long styles, but this is radically different from either in both vegetative and reproductive characters.

43. PIPER ANGUSTIPELTATUM Merr. Text fig. 49.

Piper angustipeltatum MERR. in Philip. Journ. Sci. 17 (1920) 244, Enum. Philip. Fl. Pl. 2 (1923) 3.

A diœcious vine; the branches glabrous, subterete, about 2 mm in diameter. Leaves chartaceous, with minute brown to black dots on both surfaces, oblong, 14 to 16.5 cm long, 5 to 6.5 cm wide, base equilaterally rounded and narrowly peltate, 7-nerved, apex acutely acuminate, glabrous and shining on both surfaces, reticulations somewhat obscure above, more or less prominent beneath; petioles glabrous, 2 to 3 cm long. Pistillate spikes oblong, 2.5 to 3 cm long, about 12 mm in diameter; the peduncles glabrous, about 2 cm long; rachis pilose; bracts sessile, peltate, disk glabrous, suborbicular, 0.75 to 1 mm wide; ovaries

densely crowded; styles greatly elongated, slender, 3 to 4 mm long; stigmas 2, puberulent, recurved.

LUZON, Tayabas Province, Mount Binuang, *Bur. Sci. 28846 Ramos and Edaño* (type in herb. Manila), May 19, 1917, in damp forests along rivers at low and medium altitudes. Endemic.

This species is characterized by its narrowly peltate, oblong leaves and by its greatly elongated, slender, crowded styles and conspicuously bilobed stigmas.

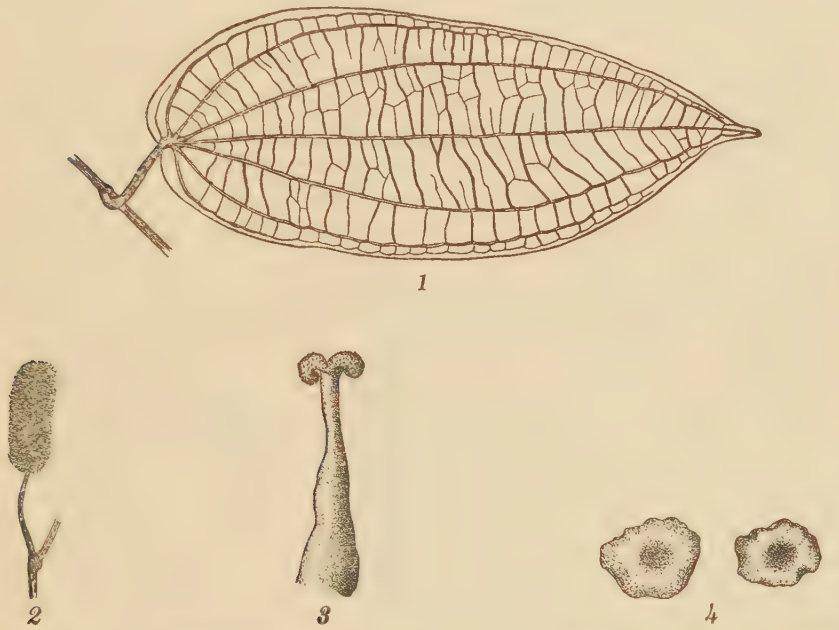

FIG. 49. *Piper angustipeltatum* Merr.; *1*, leaf, × 0.5; *2*, pistillate spike, × 0.5; *3*, pistil with long style and bilobed stigma, × 10; *4*, top view of bracts, × 10.

44. PIPER FRAGILE Benth. Text fig. 50.

Piper fragile BENTH. in Hook. Lond. Journ. Bot. 2 (1843) 234; C. DC., Prodr. 16[1] (1869) 358, Candollea 1 (1923) 182, 184.

Chavica benthamiana MIQ., Syst. Pip. (1843) 233.

Piper fragile Benth. var. *multinerve* C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 421, 11 (1916) Bot. 208, Candollea 1 (1923) 182; MERR., Enum. Philip. Fl. Pl. 2 (1923) 9.

A dicœcious vine; the branches glabrous, subterete, fragile at the nodes, 1.5 to 3 mm in diameter. Leaves chartaceous, elliptic-ovate to rounded-ovate, 4 to 7.5 cm long, 3 to 7 cm wide, base equilaterally acute, in the lower leaves rounded, subpeltate to

peltate, 5-nerved, apex shortly and acutely acuminate to acute, glabrous on both surfaces, reticulations somewhat obscure above, more or less prominent beneath; petioles glabrous, longer in the female, 1 to 2 cm long, in the lower leaves up to 2.5 cm long. Pistillate spikes abbreviated, oblong, 2 to 2.5 cm long, 0.8 to 1 cm in diameter; the peduncles glabrous, 1 to 1.5 cm long; rachis slightly hirsute; bracts sessile, peltate, disk glabrous, suborbi-

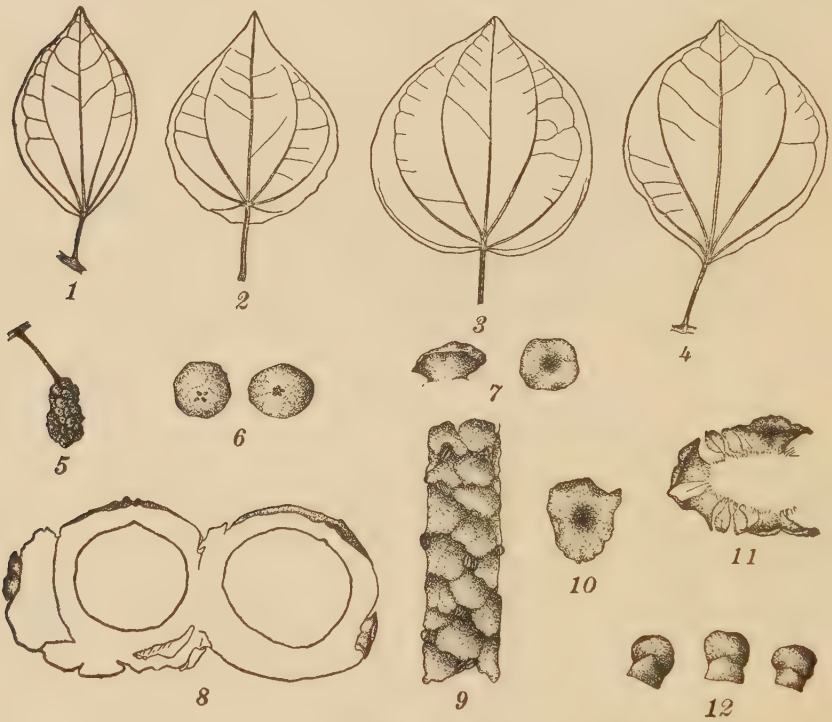

FIG. 50. *Piper fragile* Benth.; *1–4*, leaves, × 0.5; *5*, mature pistillate spike, × 0.5; *6*, top view of fruits, × 2.5; *7*, side and top views of pistillate bracts, × 10; *8*, portion of the transverse section of a pistillate spike, × 7.5; *9*, portion of a staminate spike, × 10; *10*, top view of a staminate bract, × 10; *11*, transverse section of a portion of staminate spike, × 10; *12*, stamens, × 10.

cular, about 0.8 mm wide; fruits free only at the apex, base connate, glabrous, globose, rounded, about 3 mm long, 3 to 3.2 mm in diameter; stigmas 4 or 5, free or more or less confluent, linear, acute, sessile, apical; seeds globose. Staminate spikes slender, 3.5 to 6.5 cm long, 1.5 to 2 mm in diameter; the peduncles glabrous, 1 to 1.7 cm long; rachis hirsute; bracts sessile to subsessile, peltate, disk glabrous, imbricate, orbicular, about 0.75 mm wide; stamens 2, subpedicellate, 0.5 to 0.75 mm long,

anthers ovoid, bilocular, 2-valved, filaments oblong, almost as long as the anthers or shorter.

LUZON, Tayabas Province, Mount Pular, *Bur. Sci. 19426 Ramos:* Camarines Sur Province, Pasacao, *Merrill 3366* (type collection of *Piper fragile* Benth. var. *multinerve* C. DC.). MINDANAO, Davao Province, Mati, *Bur. Sci. 49237, 48959 Ramos and Edaño;* Mount Mayo, *Bur. Sci. 49462 Ramos and Edaño.* BUCAS GRANDE, *Merrill 5271.* On rocks near the sea, in thickets and forests at low and medium altitudes. The species was originally described from New Guinea, but has recently been found on Banguey Island, British North Borneo.

Local name: Litlít-aníto (Tag.).

Bur. Sci. 40791 Ramos collected from Mount Angilog, Rizal Province, at an altitude of about 1,000 meters, resembles *Piper fragile* Benth. in most of its superficial characters, but differs in leaf apex, reticulations, and the subpeltate to peltate leaves; but due to imperfect material I have decided to postpone further consideration until more mature fruiting specimens are available. I could find no reason for retaining de Candolle's variety as it agrees in all respects with the species.

45. PIPER SARMENTOSUM Roxb. Text fig. 51.

Piper sarmentosum ROXB., Fl. Ind. 1 (1820) 162; C. DC., Prodr. 16[1] (1869) 352, Philip. Journ. Sci. 5 (1910) Bot. 424, 11 (1916) Bot. 218, Candollea 1 (1923) 187, 200; MERR., Interp. Rump. Herb. Amb. (1917) 185, Enum. Philip. Fl. Pl. 2 (1923) 15.

Chavica sarmentosa MIQ., Syst. Pip. (1843) 242.

Sirium terrestre RUMPH., Herb. Amb. 5: 344, *t. 119, f. 1.*

Piper zollingerianum C. DC., Prodr. 16[1] (1869) 351, Candollea 1 (1923) 286.

Piper zamboangae C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 424, Candollea 1 (1923) 185; MERR., Enum. Philip. Fl. Pl. 2 (1923) 17.

Piper siassiense C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 443, Candollea 1 (1923) 205; MERR., Enum. Philip. Fl. Pl. 2 (1923) 15.

Piper allenii C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 441, Candollea 1 (1923) 203; MERR., Enum. Philip. Fl. Pl. 2 (1923) 3.

An erect suffrutescent undershrub, never over 1 meter high, branching at the top, the young branches minutely puberulent, older ones glabrous, terete, 1.5 to 2.5 mm in diameter. Leaves chartaceous, the upper ones elliptic-ovate, oblong-ovate or ovate, the lower ones broadly ovate, 4.5 to 13.5 cm long, 2 to 10.5 cm wide, base equilaterally to subequilaterally subacute to rounded, in the lower leaves equilaterally subcordate to cordate, 7-plinerved, apex acutely acuminate, glabrous above, minutely puberulent on the nerves beneath, reticulations somewhat obscure

above, prominent beneath; petioles minutely puberulent, 2 to 18 mm long, in the lower leaves usually longer, 20 to 50 mm in length. Pistillate spikes abbreviated, oblong, 11 to 17 mm long, 5 to 8 mm in diameter; the peduncles minutely puberulent, 12 to 19 mm long; rachis glabrous; bracts subsessile, peltate, becoming compressed at maturity of the fruits, disk glabrous, suborbicular when spread, 1 to 1.25 mm wide; fruits free, base embedded in and concrescent with the rachis, tetragonous, gla-

FIG. 51. *Piper sarmentosum* Roxb.; *1*, fruiting branch, × 0.3; *2–4*, upper leaves, × 0.3; *5*, lower leaf, × 0.3; *6*, side view of pistillate bracts, × 5; *7*, top view of portion of mature pistillate spike, × 5; *8*, transverse section of mature pistillate spike, × 5; *9*, side view of two fruits, × 5; *10*, side and top views of staminate bracts, × 6.5; *11*, stamens before dehiscence, × 6.5; *12*, stamens after dehiscence, × 6.5.

brous, obovoid, 2 to 2.5 mm long, about 2 mm in diameter; stigmas usually 4, rarely 3 or 5, oblong-ovoid, sessile, apical, puberulent. Staminate spikes slender, 8 to 11 mm long, 1.5 to 2 mm in diameter; the peduncles minutely puberulent, 5 to 7 mm long; rachis hirtellous; bracts subsessile, peltate, disk glabrous, membranaceous, transverselly elliptic, 0.5 to 0.6 mm wide; pedicels stout, hirtellous; stamens 2, pedicellate, 0.5 to 0.75 mm long, anthers small, subglobose, bilocular, 2-valved, filaments about twice as long as the anthers, not exerted.

SAMAR, Borongan, *Merrill 11598.* NEGROS, Occidental Negros Province, Kabancalan, *Merrill 6729.* PALAWAN, Sir. J. Brooke Point, *Elmer 12587;* Lake Manguao, *Merrill 9480;* Puerto Princesa, *Bur. Sci. 45908 McGregor.* MINDANAO, Surigao Province, Surigao, *Allen 152* (type of *Piper allenii* C. DC. in herb. Manila), *Bur. Sci. 34429 Ramos and Pascasio:* Zamboanga Province, without definite locality, *Hallier s. n.* (type of *Piper zamboangae* C. DC. in herb. Manila). CAMIGUIN DE MISAMIS, Mambajao, *Elmer 14245.* SIASI, *Merrill 5311* (type collection of *Piper siassiense* C. DC.). In thickets, coco grooves, etc., at low altitudes. India to southern China, southward to the Moluccas.

Local name: Juan (Mbo.).

A species somewhat allied to *Piper betle* Linn., differing in its free fruits and habit of growth. The plant is usually an undershrub, and never attains a height of over 1 meter.

46. PIPER SIBULANUM C. DC. Text fig. 52; Plate 9.

Piper sibulanum C. DC. in Perk. Frag. Fl. Philip. (1905) 158, Philip. Journ. Sci. 5 (1910) Bot. 442, Candollea 1 (1923) 187; MERR., Enum. Philip. Fl. Pl. 2 (1923) 15.

Piper oophyllum C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 430, Candollea 1 (1923) 189; MERR., Enum. Philip. Fl. Pl. 2 (1923) 17.

Piper oophyllum C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 430, Candollea 1 (1923) 186; MERR., Enum. Philip. Fl. Pl. 2 (1923) 17.

Piper sarmentosum Roxb. forma *b* C. DC. in Philip. Journ. Sci. 11 (1916) Bot. 218.

A tricœcious (female, male, and hermaphrodite) vine; the young branches minutely puberulent, the older ones glabrous, terete, 1.5 to 3 mm in diameter. Leaves chartaceous, oblong-ovate to rounded-ovate, 8.5 to 16 cm long, 4 to 11.5 cm wide, base equilaterally to subequilaterally subobtuse to rounded, 7- to 9-plinerved, apex shortly acuminate, acumen subobtuse to obtuse, glabrous above, minutely puberulent on the nerves beneath, reticulations prominent on both surfaces; petioles minutely puberulent, 10 to 20 mm long, in the lower leaves up to 30 mm long. Pistillate spikes oblong, 2.5 to 3.5 cm long, 5 to 9 mm in diameter; the peduncles minutely puberulent, 3 to 8 mm long; rachis sparsely pilose; bracts sessile, peltate, disk glabrous, orbicular, 0.75 to 1 mm wide; fruits not free, partly embedded in and concrescent with the rachis, glabrous, globose, about 2.5 mm long, 2 mm in diameter; stigmas 3 or 4, oblong-ovoid, sessile, apical; seeds glabrous, globose, about 2 mm long. Staminate spikes 4.5 to 7 cm long, about 2 mm in diameter; the peduncles minutely puberulent, 7 to 8 mm long; rachis pilose; bracts sessile, peltate, disk orbicular, about 0.75 mm wide; stamens 2, sub-

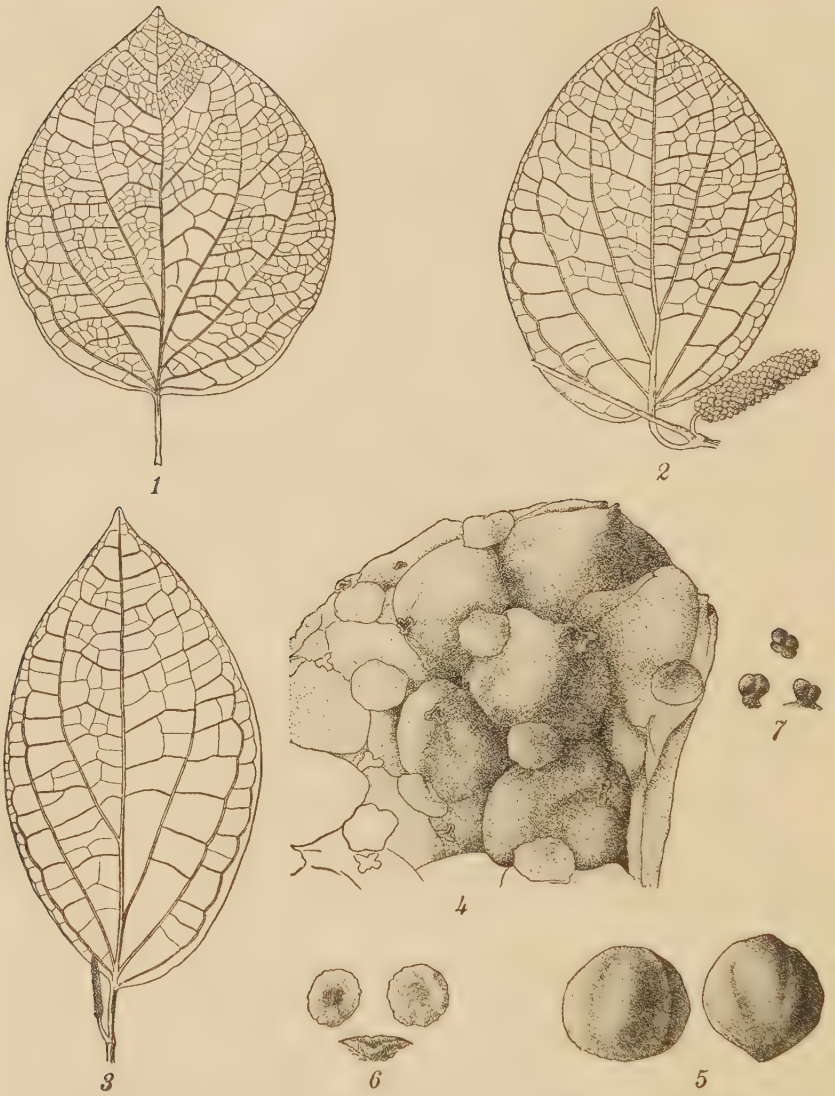

FIG. 52. *Piper sibulanum* C. DC.; *1*, leaf, × 0.5; *2*, leaf and mature pistillate spike, × 0.5; *3*, leaf and staminate spike, × 0.5; *4*, top view of a portion of a mature pistillate spike, × 7.5; *5*, seeds, × 7.5; *6*, top and side views of staminate bracts, × 10; *7*, stamens, × 10.

sessile, anthers small, subglobose, tetralocular, 2-valved. Hermaphroditic spikes oblong, 2 to 3 cm long, about 5 mm in diameter; the peduncles minutely puberulent, 5 to 6 mm long, rachis sparsely pilose; bracts and fruits like those of the female spikes, except the fruits are slightly smaller; the stamens and staminate bracts like those of the staminate spikes.

MINDANAO, Bukidnon Province, Tangkulan, *Bur. Sci. 26095 Fénix:* Davao Province, Sibulan, *Warburg 14742* (type of *Piper sibulanum* C. DC. in herb. Berlin); Davao, *Copeland 333* (type collection of *Piper oophyllum* C. DC.), *320;* Mati, *Piper 449* (type collection of *Piper sarmentosum* Roxb. forma *b* C. DC.), *431, Bur. Sci. 49062, 49184, 49599 Ramos and Edaño;* Santa Cruz, *Williams 2750* (type of *Piper williamsii* C. DC. in herb. Manila), *De Vore and Hoover 233:* Zamboanga Province, Malangas, *Bur. Sci. 36987 Ramos and Edaño.* In forests at low altitudes. Endemic.

Local name: Lauiñgan (Sub.).

A species with vegetative characters approaching *Piper sarmentosum* Roxb., differing in its habit and in its united, not free fruits. This species bears much resemblance to *Piper betle* Linn., but differs radically from the latter species, in having hermaphroditic spikes and minutely puberulent branchlets, petioles and peduncles and nerves beneath of the lamina.

47. PIPER PARONG sp. nov. Text fig. 53; Plate 10.

Frutex scandens, hermaphroditus; ramulis junioribus minute hirtellis, vetustioribus glabris; foliis chartaceis, elliptico-ovatis, 12.5 ad 16 cm longis, 6.5 ad 9.5 cm latis, basi aequilateralibus ad subaequilateralibus cuneatis, 7-plinerviis, apice subacute acuminatis, supra glabris, subtus hirtellis; spicis ♀ elongato-oblongis, recurvatis, 8.5 ad 9 cm longis, 7 ad 8 mm diametro; rachis sparse hirtellis; bracteis sessilibus, peltatis, peltis transverse subrotundatis, supra marginibusque glabris; fructibus haud liberis, partem immersis, oblongo-ovoideis, 2.25 ad 3.25 mm longis, 2 ad 2.25 mm latis; stigmatibus 3 vel 4, ovoideis, acutis; staminibus 2, sessilibus ad subsessilibus, antheris oblongis, 2-valvatis.

A hermaphroditic vine; young branches minutely hirtellous, older ones glabrous, terete, 1.5 to 3.5 mm in diameter. Leaves chartaceous, elliptic-ovate, 12.5 to 16 cm long, 6.5 to 9.5 cm wide, base equilaterally to subequilaterally cuneate, 7-plinerved, apex subacutely acuminate, glabrous above, hirtellous on the nerves beneath, reticulations more or less prominent on both surfaces; petioles minutely puberulent, long, 16 to 25 mm long. Hermaphroditic spikes recurved, elongated-oblong, 8.5 to 9 cm long, 7 to 8 mm in diameter; the peduncles glabrous to very sparingly pubescent, 8 to 10 mm long; rachis sparsely hirtellous; bracts sessile, peltate, disk glabrous, transversely subrounded, 0.6 to 0.75 mm wide; fruits not free, partly embedded in and concrescent with the rachis, glabrous, oblong-ovoid, subacute,

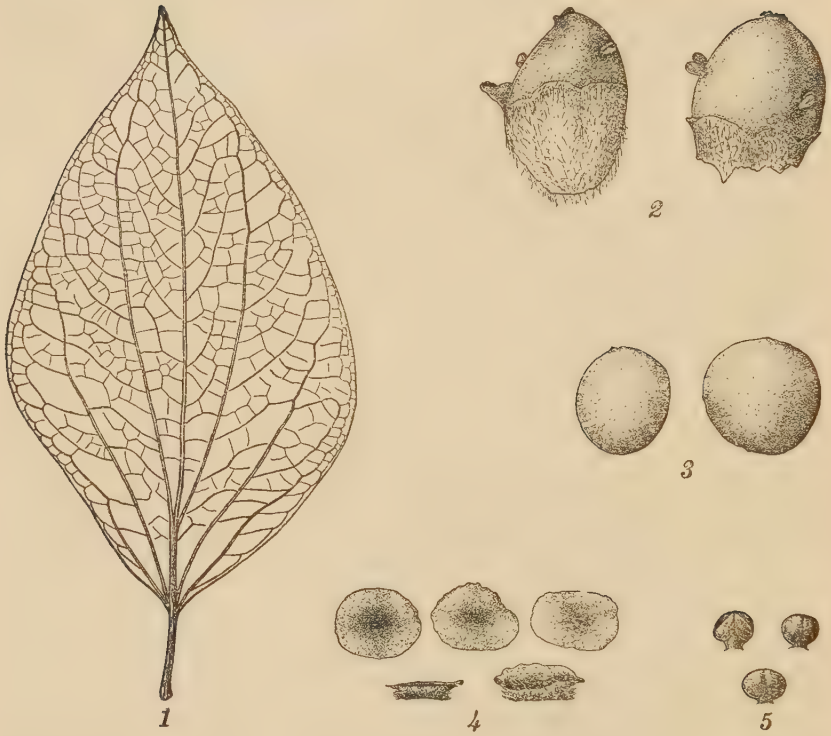

FIG. 53. *Piper parong* sp. nov.; *1*, leaf, × 0.5; *2*, fruits, × 7.5; *3*, seeds, × 7.5; *4*, top and side views of bracts, × 10; *5*, stamens, × 10.

2.25 to 3.25 mm long, 2 to 2.25 mm in diameter; stigmas 3 or 4, ovoid, acute, sessile, apical; seeds subglobose, about 2 mm long, 1.75 mm in diameter; stamens 2, scattered on the spike, sessile to subsessile, anthers small, subglobose, 2-valved.

SAMAR, Palapag, Catubig, *Bur. Sci. 24465* (type in herb. Manila), March 11, 1916, *24486 Ramos*, Feb. 20, 1916. In thickets and forests along streams at low altitudes.

Common name: Párong (Bis.).

This species is close to *Piper sibulanum* C. DC., but differs from it in its longer, recurved hermaphroditic spikes, and its elliptic-ovate leaves with cuneate bases.

48. PIPER RETROFRACTUM Vahl. Text figs. 54 and 55.

Piper retrofractum VAHL, Enum. 1 (1804) 314; USTERI, Beitr. Ken. Philip. Veg. (1905) 125; C. DC. Prodr. 16[1] (1869) 378, Perk. Frag. Fl. Philip. (1905) 157 (incl. var. *latifolium* C. DC.), Philip. Journ. Sci. 5 (1910) Bot. 439, 11 (1916) Bot. 218, Leafl. Philip. Bot. 3 (1910) 776, Candollea 1 (1923) 208–209; MERR., Fl. Manila (1912) 170, Sp. Blancoanae (1918) 118, Enum. Philip. Fl. Pl. 2 (1923) 14.

Chavica ? retrofracta MIQ., Syst. Pip. (1843) 275.
Piper parvifolium BLANCO, Fl. Filip. (1837) 23, ed. 2 (1845) 17, ed. 3, 1 (1877) 32; C. DC., Prodr. 16[1] (1869) 376, Candollea 1 (1923) 230.
Chavica parvifolia HASSK. in Flora 47 (1864) 59.
Piper officinarum C. DC., Prodr. 16[1] (1869) 356, Candollea 1 (1923) 265; F.-VILL., Novis. App. (1880) 175; VIDAL, Phan. Cuming. Philip. (1885) 138, Rev. Pl. Vasc. Filip. (1886) 219.
Chavica officinarum MIQ., Syst. Pip. (1843) 256, Nov. Act. Acad. Nat. Cur. 21 (1846) Suppl. 39, *t. 34*, Fl. Ind. Bat. 1[2] (1858–59) 444.
Piper longum RUMPH., Herb. Amb. 5: 333, *t. 116, f. 1.*
Piper longum e *Philippinis* RUMPH., Herb. Amb. 5: 334.
Pharmacum magnum vulgare RUMPH., Herb. Amb. 5: 42, *t. 26, f. 2?*
Piper longum BLUME in Verh. Bat. Genoots. 11 (1826) 197, *t. 19*, non Linn.
Piper chaba HUNTER in As. Res. 9 (1809) 391; MIQ., Syst. Pip. (1843) 256, Nov. Act. Acad. Nat. Cur. 21 (1846) Suppl. 40; C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 432.
Piper palawanum C. DC. in Philip. Journ. Sci. 11 (1916) Bot. 210, Candollea 1 (1923) 266; MERR., Enum. Philip. Fl. Pl. 2 (1923) 13.

A dicœcious vine; the branches glabrous, terete, 2 to 3.5 mm in diameter. Leaves pale when dry, chartaceous, oblong, oblong-ovate, or elliptic-lanceolate, 6 to 17.5 cm long, rarely up to 21 cm long, 3.2 to 8.5 cm wide, base subequilaterally to inequilaterally acute to cordulate, penninerved, 7 to 11 nerves on each side of the midrib, apex shortly and acutely acuminate to acute, glabrous on both surfaces, reticulations somewhat obscure above, prominent beneath; petioles glabrous, 5 to 11 mm long, in the lower leaves up to 18 mm long, in the leaves of sterile plants up to 30 mm long. Pistillate spikes oblong, 3.2 to 5.5 cm long, 6.5 to 11 mm in diameter; the peduncles glabrous, 10 to 18 mm long, rarely 30 to 45 mm long; rachis glabrous; bracts sessile, peltate, disk glabrous, usually transversely oblong, sometimes suborbicular, 1 to 1.25 mm wide; fruits more or less united, partly or wholly embedded in and concrescent with the rachis; stigmas 3, short, recurved, ovoid, acute; seeds subglobose to obovoid-globose, 2 to 2.5 mm long. Staminate spikes 3.8 to 8.5 cm long, 2.5 to 4.5 mm in diameter; the peduncles glabrous, 10 to 18 mm long; rachis glabrous; bracts subsessile, peltate, disk glabrous, firm, suborbicular to orbicular; stamens 2 or 3, sessile, anthers broadly oblong, subtetragonous, tetralocular, 4-valved.

BABUYANES ISLANDS, Dalupiri Island, *Bur. Sci. 10651, 10638 McGregor:* Camiguin Island, *Bur. Sci. 4092 Fénix.* LUZON, Ilocos Norte Province, without definite locality, *Cuming 1248;* Burgos, *Bur. Sci. 32932, 32935, 32951 Ramos, 43559 McGregor:* Cagayan Province, Buguey, *Warburg 12125* (type of *Piper retro-*

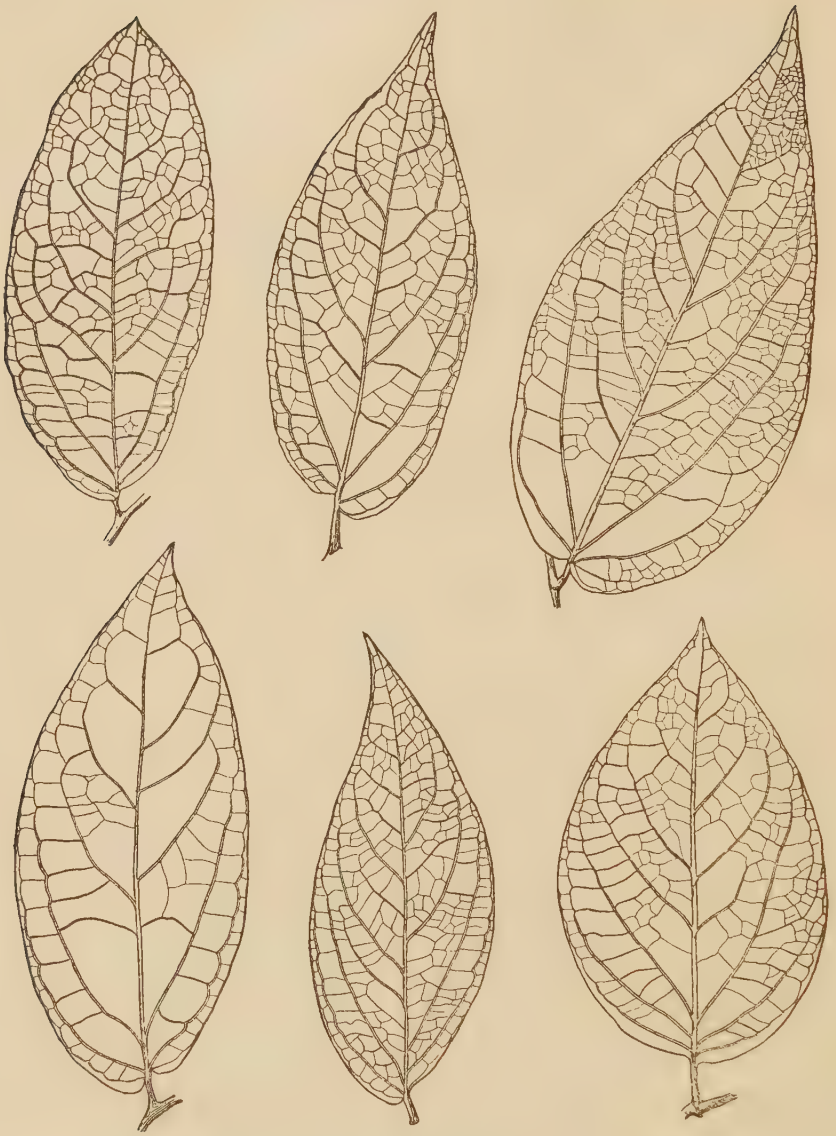

FIG. 54. *Piper retrofractum* Vahl; leaves, × 0.5.

fractum Vahl var. *latifolium* C. DC. in herb. Berlin); Tabuc, *Bolster 157:* Abra Province, Caburao, *For. Bur. 21961 Adduru:* La Union Province, San Fernando, *Lete 69:* Pangasinan Province, Rosales, *Warburg 13318;* Umingan, *Bur. Sci. 17904 Otanes, For. Bur. 22902 Maneja:* Nueva Viscaya Province, Dupax, *Bur. Sci. 8239 Ramos:* Nueva Ecija Province, Cabanatuan, *Bur. Sci.*

FIG. 55. *Piper retrofractum* Vahl; *1–2*, leaves, × 0.5; *3*, top view of pistillate bracts, × 10; *4*, longitudinal section of a fruit, × 7.5; *5*, mature pistillate spike, × 0.5; *6*, transverse section of a mature pistillate spike, × 7.5; *7*, top and side views of staminate bracts, × 10; *8*, stamens, 10.

5294 McGregor: Bulacan Province, Angat, *Merr. Sp. Blancoanae 523:* Bataan Province, Mount Mariveles, *Elmer 6862, Williams 302, Merrill 3165, For. Bur. 57 Barnes, 1911 Borden;* Duale, *For. Bur. 20039 Topacio:* Rizal Province, without definite locality, *Vidal 3544;* Masambong, *Philip. Pl. 268 Merrill;* Baras, *Bur. Sci. 11876 Robinson and Ramos;* Jalajala, *Bur. Sci. 11935 Ro-*

binson and Ramos; Malapad na Bato, *Bur. Sci. 12198 Ramos;* Parañaque, *Merrill 7093;* Mount Lumutan, *Bur. Sci. 29771 Ramos and Edaño;* Montalban, *Loher 12733;* Pililla, *For. Bur. 26423 Maneja;* without definite locality, *Philip. Pl. 2020 Ramos, Loher 15043:* Cavite Province, *Bur. Sci. 22530 Ramos and Deroy:* Laguna Province, Galas, *Bur. Sci. 22996, 23128 McGregor;* Pagsanjan, *Langlasse 13;* Los Baños, *Elmer 18088, Gates and Lopez 5636, For. Bur. 20364 Ponce.* MINDORO, Baco, *Merrill 1238, For. Bur. 5512 Merritt;* Puerta Galera, *Merrill 3342;* Pinamalayan, *Bur. Sci. 41042 Ramos.* PANAY, Capiz Province, Mount Timbaban, *Bur. Sci. 42473 Edaño:* Antique Province, Lipata, *Bur. Sci. 32574 McGregor:* Iloilo Province, without definite locality, *Vidal 3527, 3529.* GUIMARAS, *Vidal 3528.* PALAWAN, without definite locality, *Vidal 1672;* Babuyan, *Bur. Sci. 15573 Fénix* (type collection of *Piper palawanum* C. DC.); Ulugan Bay, *Merrill 7216;* Taytay, *Merrill 9254;* Alfonzo, *Bur. Sci. 19341 Weber;* Puerto Princesa, *Bur. Sci. 190 Bermejos;* Iwahig, *Bur. Sci. 851 Foxworthy.* In thickets at low altitudes, usually common. Indo-China and the Malay Peninsula to the Moluccas.

Local names: Amáras (Ilk.); boyo-bóyo (Tagb.); kamára (Ilk.); kayungo (Tag.); litlít (Ilk., Tag.); sabía (Tag.); salimára (Tag.); soag-matsíng (Tag.); súbong-manók (Tag.).

Piper longum as interpreted by Blume is evidently from its description and illustration *Piper retrofractum* Vahl. I agree with Merrill[7] in his interpretation of the Amboina material: "The figure of *Piper longum* Rumph., however, seems to represent Vahl's species, this reduction being in agreement with Miquel and C. de Candolle. I follow Miquel also in reducing here *Pharmacum magnum vulgare* Rumph. who considered that it represented a form near *Chavica officinarum* Miq." I am likewise incorporating here *Piper chaba* Hunter as a synonym on the authority of both Miquel and C. de Candolle.

This species, obviously allied to *Piper philippinum* Miq., differs from it in its glabrous rachis in both male and female spikes, and its larger staminate bracts. The species is further characterized by its broadly oblong, subtetragonous, 4-valved anthers.

49. PIPER PHILIPPINUM Miq. Text figs. 56-58; Plate 17, fig. 6.

Piper philippinum MIQ., Syst. Pip. (1843) 322, Fl. Ind. Bat. 1[2] (1858–59) 453; C. DC., Prodr. 16[1] (1869) 348, Philip. Journ. Sci. 5 (1910) Bot. 437, Candollea 1 (1923) 190; F.-VILL., Novis. App. (1880)

[7] Inter. Rumph. Herb. Amb. (1917) 183.

175; VIDAL, Phan. Cuming. Philip. (1885) 138, Rev. Pl. Vasc. Filip. (1886) 219; MERR., Enum. Philip. Fl. Pl. 2 (1923) 13.

Piper lucbanense C. DC. in Leafl. Philip. Bot. 6 (1914) 2293, Candollea 1 (1923) 198; MERR., Enum. Philip. Fl. Pl. 2 (1923) 11.

Piper lividum C. DC. in Perk. Frag. Fl. Philip. (1905) 155, Philip. Journ. Sci. 5 (1910) Bot. 462, Candollea 1 (1923) 230; MERR., Enum. Philip. Fl. Pl. 2 (1923) 8.

Piper petraeum C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 430, Candollea 1 (1923) 189; MERR., Enum. Philip. Fl. Pl. 2 (1923) 13.

Piper crassilimbum C. DC., in Philip. Journ. Sci. 11 (1916) Bot. 210, Candollea 1 (1923) 187; MERR., Enum. Philip. Fl. Pl. 2 (1923) 7.

A dicœcious vine; the branches glabrous, terete, 1.75 to 3.25 mm in diameter. Leaves chartaceous to subcoriaceous, elliptic-lanceolate, oblong-elliptic, subovate-elliptic, or subobovate-elliptic-ovate, 10 to 25 cm long, 4.5 to 11 cm wide, base equilaterally to subequilaterally acute to cordulate, 7-plinerved, apex shortly and acutely acuminate to acute, glabrous and shining on both surfaces, reticulations somewhat obscure above, prominent beneath; petioles glabrous, 6 to 23 mm long, in the lower leaves up to 30 mm long. Pistillate spikes oblong, 3 to 9 cm long, 8 to 12 mm in diameter; the peduncles glabrous, 6 to 20 mm long; rachis pilose, bracts sessile, peltate, disk glabrous, orbicular, 1 to 1.25 mm wide; fruits with base partly embedded in and concrescent with the rachis, subovoid-oblong to globose, umbonate, 2.75 to 3.25 mm long, 2.25 to 3 mm in diameter; stigmas 3, rarely 4, broadly ovoid, sessile, apical; seeds glabrous, oblong to globose, 2.5 to 3 mm long. Staminate spikes 5 to 12 cm long, 2 to 3 mm in diameter; the peduncles glabrous, 5 to 19 mm long; rachis densely pilose; bracts subpedicellate, peltate, 0.5 to 0.6 mm long, disk glabrous, orbicular, 1 to 1.25 mm wide; stamens 2, pedicellate, 0.5 to 0.75 mm long, anthers oblong to subglobose, 2-valved.

LUZON, Isabela Province, Malunu, *Warburg 11930* (type of *Piper lividum* C. DC. in herb. Berlin): Benguet Subprovince, Baguio, *Merrill 7649* (type collection of *Piper crassilimbum* C. DC.), *7660, Sandkuhl 158;* Twin Peaks, *Elmer 6430* (type collection of *Piper petraeum* C. DC.): Nueva Ecija Province, Mount Umingan, *Bur. Sci. 26347, 26393 Ramos and Edaño:* Cavite Province, Mendez, *Bur. Sci. 1316 Mangubat:* Rizal Province, without definite locality, *Loher 14799;* Santa Ines, *Bur. Sci. 26205 Ramos;* Mount Lumutan, *Bur. Sci. 29583 Ramos and Edaño;* Mount Irid, *Bur. Sci. 48428 Ramos and Edaño:* Laguna Province, Los Baños, Mount Maquiling, *Bur. Sci. 26913 Mabesa, Elmer 18010;* Mount Banahao, *Quisumbing 1261:* Tayabas Province, Lucban,

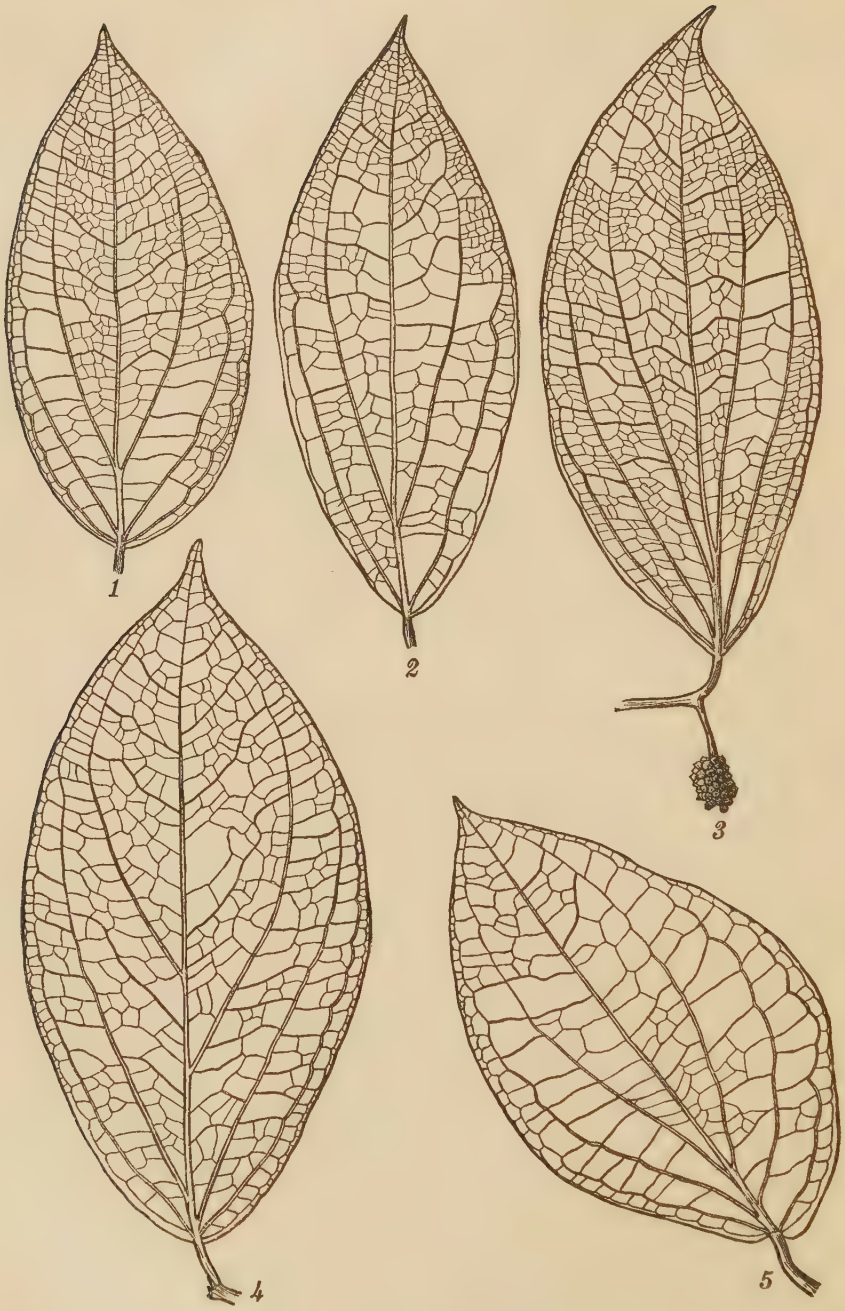

FIG. 56. *Piper philippinum* Miq.; *1–2*, *4–5*, leaves, × 0.5; *3*, leaf and part of the pistillate spike, × 0.5.

FIG. 57. *Piper philippinum* Miq.; leaves, × 0.5.

Elmer 7383 (type collection of *Piper lucbanense* C. DC.); hills near Malinao, *Baker 3249;* Malbug, *For. Bur. 29803 Gamalinda and Cohinhinan;* Mount Tulaog, *Bur. Sci. 29127, 29131 Ramos and Edaño:* Albay Province, without definite locality, *Cuming 912* (type of *Piper philippinum* Miq. in herb. de Less.; isotype in herb. Manila): Sorsogon Province, Irosin, Mount Bulusan, *Elmer 14377, 14432.* MASBATE, *Merrill 3050.* LEYTE, Tigbao, Tacloban, *Wenzel 1542, 1543.* PANAY, Antique Province, Culasi, *Bur. Sci. 32390, 32421, 32520 McGregor.* MINDANAO, Surigao Province, Surigao, *Bur. Sci. 34363 Ramos and Pascasio;* Placer, *Wenzel 2606, 2949, 3250, 3252:* Bukidnon Province, Botoan, *Bur. Sci. 21398 Escritor:* Agusan Province, Cabadbaran, Mount Urdaneta, *Elmer 13396, 13445:* Davao Province, Todaya, Mount Apo, *Elmer 11056:* Zamboanga Province, Mount Tubuan, *Bur. Sci. 36701 Ramos and Edaño.* In thickets and forests at low and medium altitudes, ascending to 1,550 meters. Endemic.

Local names: Buyo-buyo (S. L. Bis.); litlít (Buk.); palay-butó (Mag.).

Having examined the types and isotypes of all the synonyms above cited, and a great number of specimens, I can see no reason for distinguishing more than one species. This striking species, as well as *Piper albidirameum* C. DC. and *Piper maagnasanum*

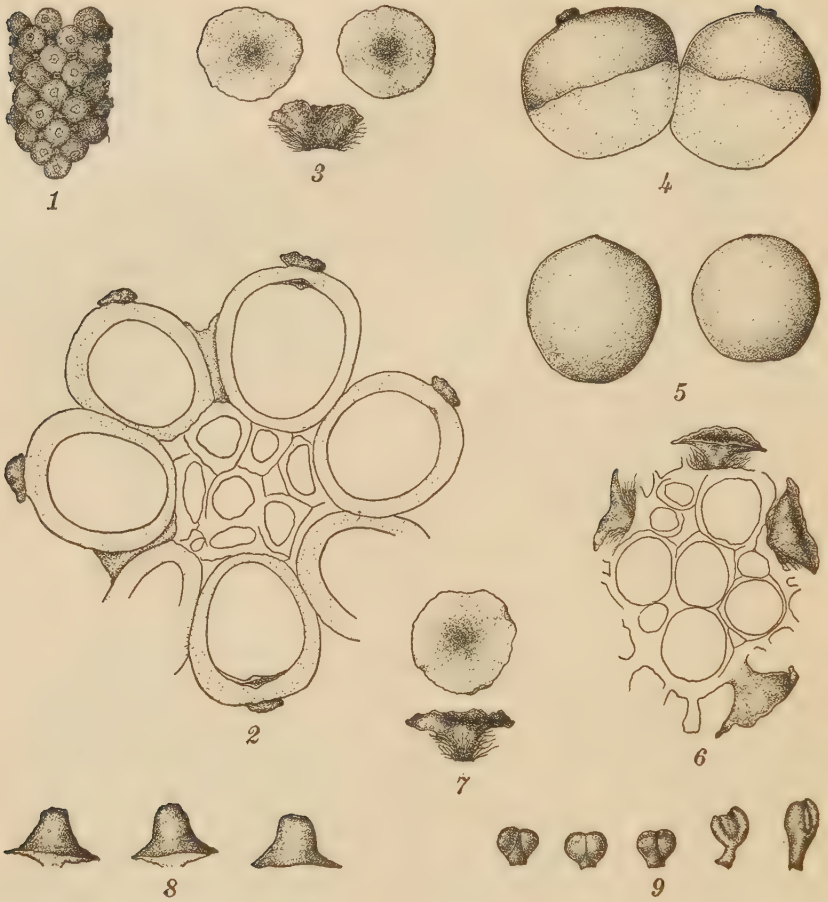

FIG. 58. *Piper philippinum* Miq.; *1*, portion of mature pistillate spike, × 1.5; *2*, transverse section of a mature pistillate spike, × 7.5; *3*, top and side views of pistillate bracts, × 10; *4*, fruits, × 7.5; *5*, seeds, × 7.5; *6*, transverse section of a staminate spike, × 10; *7*, top and side views of staminate bracts, × 10; *8*, sterile ovaries, × 10; *9*, stamens before and after dehiscence, × 10.

C. DC., is characterized by its unique staminate spikes, which are pseudohermaphroditic. While the ovaries are present in the staminate spikes, they do not develop as in the other hermaphroditic forms, and remain sterile. Two kinds of staminate spikes are found, one in which the stamens are more abundant than the sterile ovaries, and the other in which the sterile ovaries are more abundant than the stamens. In the latter case more stamens are found restricted somewhat at the apex of the spike. The stamens when young are sessile, becoming pedicellate at maturity of the spike. This species is also distinguished from

the group of species with the bases of the fruits partly embedded in and concrescent with the rachis by its leaves, the bases of which are sometimes cordulate and its larger fruits.

50. PIPER ALBIDIRAMEUM C. DC. Text fig. 59.

Piper albidirameum C. DC. in Perk. Frag. Fl. Philip. (1905) 153, Leafl. Philip. Bot. 3 (1910) 771, Philip. Journ. Sci. 5 (1910) Bot. 428, 11 (1916) Bot. 213, Candollea 1 (1923) 191; MERR., Enum. Philip. Fl. Pl. 2 (1923) 8.

Piper pendulifolium C. DC. in Leafl. Philip. Bot. 3 (1910) 772, Philip. Journ. Sci. 5 (1910) Bot. 429, Candollea 1 (1923) 191; MERR., Enum. Philip. Fl. Pl. 2 (1923) 8.

A diœcious vine, the branches glabrous, terete, 3 to 6 mm in diameter. Leaves chartaceous to subcoriaceous, the younger ones membranaceous, broadly oblong-elliptic to broadly oblong-ovate, 14.5 to 28.5 cm long, 6.5 to 18 cm wide, base equilaterally to subequilaterally obtuse to cordulate, 7- to 9-plinerved, apex shortly and acutely or obtusely acuminate, glabrous and shining on both surfaces, reticulations distinct beneath; petioles rather stout, glabrous, 1.5 to 2.5 cm long. Pistillate spikes oblong to elongated oblong, 3 to 6.5 cm long, about 9 mm in diameter; the peduncles glabrous, 1 to 2 cm long; rachis pilose; bracts sessile, peltate, disk glabrous, orbicular, 0.75 to 1 mm wide; fruits with bases embedded in and concrescent with the rachis, subobovoid-globose, umbonate, 2.25 to 2.5 mm in diameter; stigmas 3 or 4, rounded-ovate, fleshy, sessile, apical; seeds glabrous, globose, 2 to 2.25 mm in diameter. Staminate spikes greatly elongated, cylindric, 7.5 to 17.5 cm long, 2 to 3 mm in diameter; the peduncles glabrous, 1 to 1.5 cm long; rachis pilose; bracts sessile, peltate, about 1.25 mm wide; stamens 2, sessile, anthers oblong, 2-valved.

LUZON, Apayao Subprovince, Ngagan, *Bur. Sci. 28059 Fénix:* Rizal Province, Bosoboso, *Bur. Sci. 1118 Ramos:* Laguna Province, Mount San Cristobal, *Juliano 1078:* Tayabas Province, Mount Binuang, *Bur. Sci. 28529 Ramos and Edaño:* Camarines Province, Adiagnao, *Bur. Sci. 6374 Robinson.* MINDORO, Palauan, *Bur. Sci. 39826 Ramos;* Pinamalayan, *Bur. Sci. 40896 Ramos.* SAMAR, Catubig River, *Bur. Sci. 24198 Ramos.* PANAY, Capiz Province, Jamindan, *Bur. Sci. 31094, 31241, 31356 Ramos and Edaño;* Libacao, *Bur. Sci. 31428 Ramos and Edaño;* Mount Timbaban, *Bur. Sci. 42368 Edaño:* Antique Province, Batbatan Island, *Bur. Sci. 32250 McGregor.* BOHOL, Valencia, *Bur. Sci. 42838, 43089, 43238 Ramos.* MINDANAO, Davao Province,

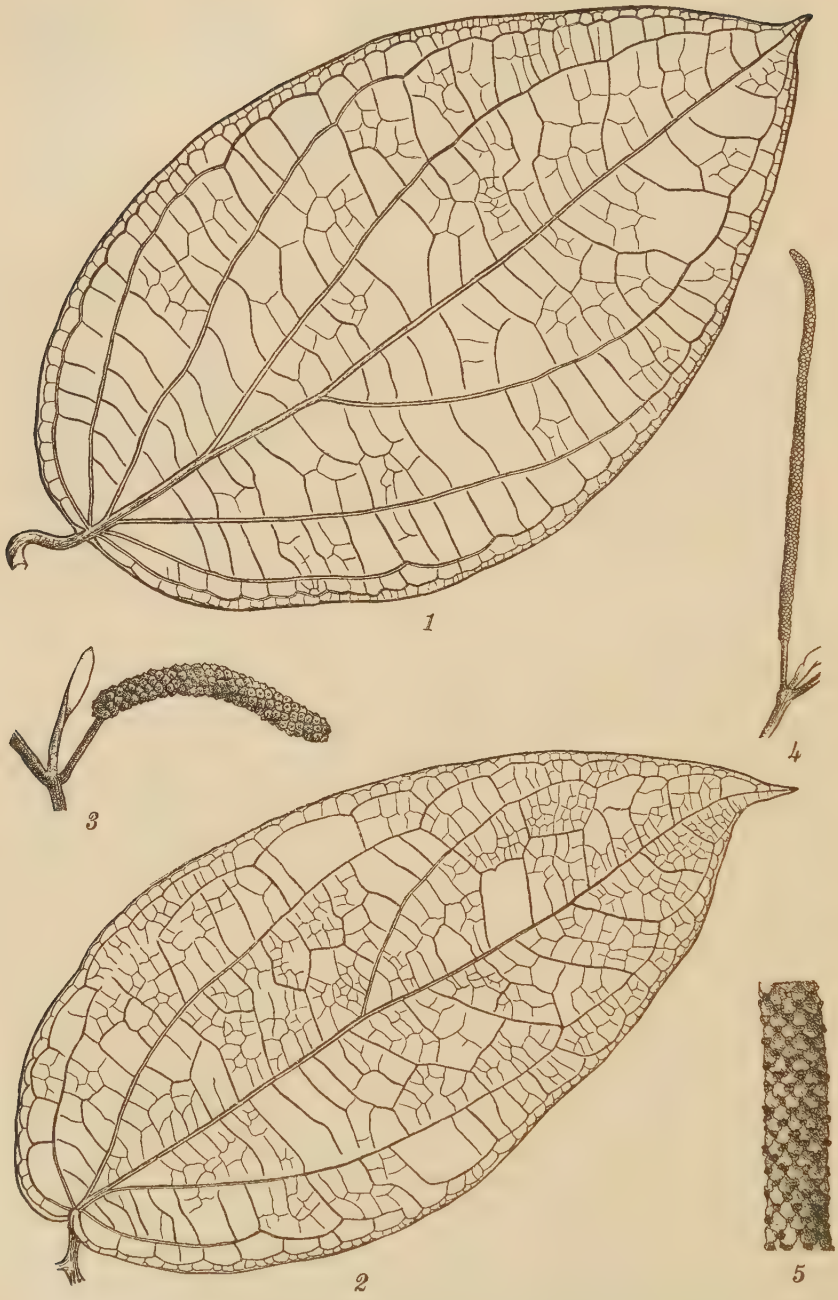

FIG. 59. *Piper albidirameum* C. DC.; *1–2*, leaves, × 0.5; *3*, mature pistillate spike, × 0.5; *4*, staminate spike, × 0.5; *5*, portion of staminate spike, × 2.

Taumo, *Warburg 14751* (type of *Piper albidirameum* C. DC. in herb. Berlin) ; Todaya, Mount Apo, *Elmer 10942* (type collection of *Piper pendulifolium* C. DC.) : Bukidnon Province, Impasuyong, *Wester 107.* In forests and thickets, at low altitudes, ascending to 700 meters. Endemic.

Local names: Kángal (Bag.) ; lakbaugan (Mbo.) ; lauiñgan (Buk.) ; litlít-kalabau (Mang.) ; makago (Mbo.) ; manikatapái (Bag.).

The pistillate spikes of this species resemble those of *Piper philippinum* Miq. This species is distinguished from *Piper philippinum* Miq. by its much larger broadly oblong-elliptic to broadly oblong-ovate leaves, with usually cordulate bases and by its much longer staminate spikes.

51. PIPER MAAGNASANUM C. DC. Text fig. 60.

Piper maagnasanum C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 429, Candollea 1 (1923) 258; MERR., Enum. Philip. Fl. Pl. 2 (1923) 8.
Piper psilocarpum C. DC. in Philip. Journ. Sci. 11 (1916) Bot. 215, Candollea 1 (1923) 198; MERR., Enum. Philip. Fl. Pl. 2 (1923) 8.
Piper fuscescentirameum C. DC. in Philip. Journ. Sci. 11 (1916) Bot. 217, Candollea 1 (1923) 214; MERR., Enum. Philip. Fl. Pl. 2 (1923) 8.

A dicœcious vine, the branches glabrous, terete, 3 to 6.5 mm in diameter. Leaves chartaceous to coriaceous, broadly elliptic-ovate to broadly rounded-ovate, 14.5 to 35 cm long, 10.5 to 27.5 cm wide, base equilaterally to subequilaterally broadly acute to obtuse or broadly cordate, 9-plinerved, apex shortly and acutely or subobtusely acuminate, glabrous and shining on both surfaces, the nerves very prominent, reticulations distinct; petioles rather stout, glabrous, 10 to 43 mm long. Pistillate spikes elongated oblong, 2.8 to 6 cm long, 7 to 10 mm in diameter; the peduncles, rachis, fruits, bracts, and seeds similar to the preceding species; stigmas usually 3, fleshy. Staminate spikes and parts similar to preceding species.

LUZON, Ilocos Norte Province, Burgos, *Bur. Sci. 32899, 32929 Ramos:* Apayao Subprovince, Ngagan, *Bur. Sci. 28114 Ramos and Edaño:* Rizal Province, Mount Lumutan, *Bur. Sci. 29784 Ramos and Edaño:* Laguna Province, San Antonio, *Bur. Sci. 16597, 16630 Ramos;* Siniloan, *Bur. Sci. 23045 McGregor:* Tayabas Province, Atimonan, *Copeland and Campbell 6504;* Mount Dingalan, *Bur. Sci. 26621 Ramos and Edaño;* Infanta-Siniloan trail, *Bur. Sci. 29220 Ramos and Edaño;* Casiguran, *Bur. Sci. 45391 Ramos and Edaño:* Camarines Norte Province, Paracale,

FIG. 60. *Piper maagnasanum* C. DC.; *1–3*, leaves, × 0.3; *4*, longitudinal section of a fruit, × 5; *5*, same with a bract attached, × 5.

Bur. Sci. 33522 Ramos and Edaño: Camarines Sur Province, Maagnas, *Bur. Sci. 6355 Robinson* (type collection of *Piper maagnasanum* C. DC.) : Sorsogon Province, Irosin, Mount Bulusan, *Elmer 16261;* Mount Bagacana, *Bur. Sci. 23558 Ramos.* ALABAT, Sangerin, *Bur. Sci. 48316 Ramos and Edaño.* SAMAR, Catubig River, *Merrill 11594.* LEYTE, Jaro, Buenavista, *Wenzel 896* (type collection of *Piper psilocarpum* C. DC.), *1006, 1151, 1184* (type collection of *Piper fuscescentirameum* C. DC.) ; Tigbao, *Wenzel 1288, 1478;* Cabalian, *Bur. Sci. 41597 Ramos.* MINDORO, Naujan, *Bur. Sci. 46438 Ramos.* BILIRAN, *Bur. Sci. 18706 McGregor.* MINDANAO, Surigao Province, Surigao, *Bur. Sci. 34509 Ramos and Pascasio:* Agusan Province, Cabadbaran, Mount Urdaneta, *Elmer 13309:* Davao Province, Mati, *Bur. Sci. 49132 Ramos and Edaño.* BUCAS GRANDE, *Bur. Sci. 35084 Ra-*

mos and Pascasio. Usually at low altitudes, but sometimes ascending to 500 meters. Endemic.

Local names: Gaúed (Ibn.); maragúm (Bis.).

This differs from *Piper albidirameum* C. DC. in its broadly elliptic-ovate to broadly rounded-ovate leaves. While in general the fruits resemble those of the preceding species, one finds also ovoid ones with prominent subacute apices and fairly pronounced rather short persistent styles.

52. PIPER ENSIFOLIUM sp. nov. Text fig. 61; Plate 11.

Frutex dioicus, scandens; ramulis glabris, 3 ad 4.5 mm diametro; foliis chartaceis, anguste lanceolatis, 15.5 ad 30 cm longis, 2 ad 3.4 cm latis, basi inaequilateralibus rotundato-auriculatis, 5- ad 7-plinerviis, apice acute attenuatis, utrinque gla-

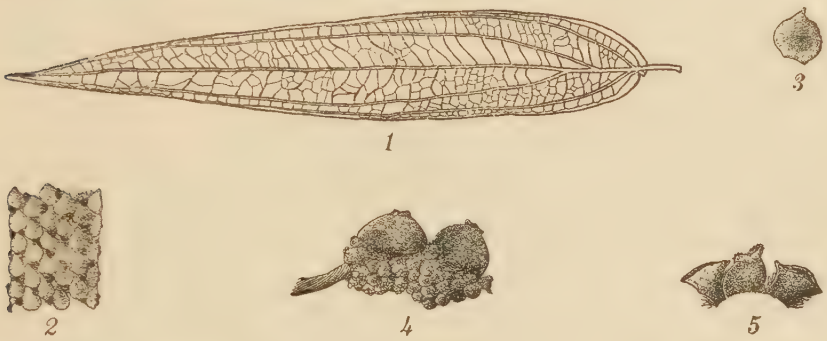

FIG. 61. *Piper ensifolium* sp. nov.; *1*, leaf, × 0.5; *2*, portion of a young pistillate spike, × 3; *3*, top view of a pistillate bract, × 7.5; *4*, portion of a pistillate spike, × 2; *5*, side view of pistillate bracts and an ovary, × 7.5.

bris; spicis ♀ oblongis, 3.5 ad 4 cm longis, 4 ad 6 mm diametro; pedunculis 1.5 ad 2.5 cm longis; rachis parcissime pilosis; bracteis pedicellatis, peltatis, 0.5 ad 0.8 mm longis, peltis subrotundato-ovatis, supra marginibusque glabris, 0.5 ad 1 mm latis, pedicellis ciliatis; fructibus liberis, basi partim immersis, globosis; stigmatibus 3, sessilibus, rotundatis, mamillatis.

A dicœcious vine, the branches glabrous, terete, 3 to 4.5 mm in diameter. Leaves chartaceous, with glandular black dots beneath, narrowly lanceolate, 15.5 to 30 cm long, 2 to 3.4 cm wide, base inequilaterally rounded, auriculate, 5- to 7-plinerved, apex attenuate, acute, glabrous on both surfaces, more or less shining above; petioles glabrous, 1 to 2 mm long. Pistillate spikes pendulous, oblong, 3.5 to 4 cm long, 4 to 6 mm in diameter; the peduncles glabrous, 1.5 to 2.5 cm long; rachis slightly pilose;

bracts pedicellate, peltate, 0.5 to 0.8 mm long, disk glabrous, subrounded-ovate, 0.5 to 1 mm wide; fruits with their bases partly embedded in and concrescent with the rachis, glabrous, globose, 3 to 3.5 mm long, 2.5 to 3 mm in diameter; stigmas 3, rounded, mamillate.

LUZON, Tayabas Province, Casiguran, *Bur. Sci. 45433 Ramos and Edaño* (type in herb. Manila), May 29, 1925, in damp forests along streams, at low altitudes: Ilocos Norte Province, Bangui to Claveria, *Bur. Sci. 32991 Ramos* (sterile).

A species characterized by its narrowly lanceolate leaves with auriculate bases, and its mamillate stigmas.

53. PIPER CANINUM Blume. Text figs. 62, 1–2; 63, 7–8; 64, 1–3; 65, 1, 8–10; Plate 17, fig. 2.

Piper caninum BLUME in Verh. Bat. Genoots. 11 (1826) 214; A. DIETR., Sp. Pl. 1 (1831) 681; MIQ., Comm. Phyt. (1839) 17, 33, *t. 3;* C. DC., Prodr. 16[1] (1869) 341, Philip. Journ. Sci. 5 (1910) Bot. 458, 11 (1916) Bot. 224, Candollea 1 (1923) 225; F.-VILL., Novis. App. (1880) 175; VIDAL, Rev. Pl. Vasc. Filip. (1886) 219; MERR., Enum. Philip. Fl. Pl. 2 (1923) 5.

Cubeba canina MIQ., Syst. Pip. (1843) 293.

Piper perpunctatum C. DC. in Philip. Journ. Sci. 11 (1916) Bot. 219, Candollea 1 (1923) 200; MERR., Enum. Philip. Fl. Pl. 2 (1923) 13.

A dicœcious vine; the branches puberulent, terete, 1.5 to 3 mm in diameter. Leaves chartaceous, oblong-ovate to ovate, 6 to 11 cm long, 3 to 6 cm wide, base equilaterally to subinequilaterally subacute to obtuse, the lower leaves subcordate to cordate, 5- to 7-plinerved, apex acutely acuminate, glabrous above, hirsute beneath, reticulations somewhat prominent on both surfaces; petioles hirtellous, 5 to 15 mm long, in the lower leaves up to 30 mm long. Pistillate spikes 3.5 to 4.5 cm long, about 1.5 cm in diameter; the peduncles hirsute, 10 to 20 mm long; rachis densely hirsute; bracts sessile, peltate, disk, orbicular, 0.5 to 1 mm wide, upper surface and margin ciliate; fruits pedicellate, glabrous, ellipsoid to ovoid-globose, 4 to 5 mm long, 3 to 3.5 mm in diameter, the pedicels glabrous, up to 5 mm in length; stigmas 3 or 4, rarely 2 or 5, ovoid, acute, sessile, apical. Staminate spikes slender, 10 to 20 mm long, 1 to 1.5 mm in diameter, the peduncles puberulent, 5 to 8 mm long; rachis hirsute; bracts subsessile, peltate, 0.3 to 0.4 mm long, disk glabrous above, margin ciliate, orbicular, about 0.5 mm wide; stamens 2, pedicellate, 0.5 to 0.75 mm long, anthers very small, globose, tetralocular, 2-valved, filaments as long as the anthers or slightly longer, exerted.

FIG. 62. Leaves of: *1–2, Piper caninum* Blume; *3,* var. *glabribracteum* C. DC.; *4–6,* var. *lanaoense* C. DC.; *7,* var. *oblongifolium* var. nov.; *8–9,* var *basilanum* C. DC. All × 0.3.

PALAWAN, Malampaya, *Merrill 7246* (type collection of *Piper perpunctatum* C. DC.); Lake Manguao, *Merrill 9462.* BUSUANGA, Bintuna, *Weber 1548bis.* In forests at low altitudes.

The widely distributed *Piper caninum* Blume was based on Javan material and extends from the Malay Peninsula to New Guinea. In the Philippines the species is represented by few collections only, from Palawan and Busuanga. *Piper perpunctatum* C. DC. (male) agrees in all essential characters with *Piper caninum* Blume, and is therefore reduced as a synonym. All varieties herein recorded are endemic to the Philippines, and have bracts which are glabrous above and on the margins.

Var. GLABRIBRACTEUM C. DC. Text figs. 62, 3; 64, 4; 65, 2.

Piper caninum BLUME var. *glabribracteum* C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 459, Candollea 1 (1923) 225; MERR., Enum. Philip. Fl. Pl. 2 (1923) 5.

Branches glabrous. Leaves ovate-lanceolate to oblong-subelliptic, 7 to 13.5 cm long, 3 to 6.5 cm wide, base equilaterally to subequilaterally acute to subobtuse, 5-plinerved, apex acutely acuminate, glabrous above, sparsely pilose beneath. Pistillate

spikes 2.5 to 4 cm long, the peduncles glabrous to hirtellous, 13 to 23 mm long; bracts sessile, peltate, disk rounded-obovate to orbicular, 0.75 to 1.25 mm wide; fruits ovoid-ellipsoid, 3.5 to 4.5 mm long, 3 to 4.5 mm in diameter.

MINDANAO, Surigao Province, Placer, *Wenzel 1815:* Lanao Province, Camp Keithley, Lake Lanao, *Clemens 176* (type of *Piper caninum* Blume var. *glabribracteum* C. DC. in herb. Manila), *Clemens s. n.:* Zamboanga Province, Malangas, *Bur. Sci. 37002 Ramos and Edaño.* In forests at low altitudes. Endemic.

This variety differs from the species principally by its glabrous bracts and the less pubescent lamina.

Var. LANAOENSE C. DC. Text figs. 62, 4–6; 64, 5; 65, 3.

Piper caninum Blume var *lanaoense* C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 459, Candollea 1 (1923) 226; MERR., Enum. Philip. Fl. Pl. 2 (1923) 5.

Branches glabrous to hirsute. Leaves oblong-elliptic to oblong-ovate, lower leaves heart-shaped, 8.5 to 14 cm long, 3.5 to 6.5 cm wide, base equilaterally subacute to rounded, 7-plinerved, apex acutely to subobtusely acuminate, slightly hirtellous on the nerves above, densely hirsute on the nerves beneath. Pistillate spikes 2.5 to 4.5 cm long, the peduncles glabrous, 1.5 to 1.8 cm long; bracts subsessile, peltate, disk suborbicular, 0.75 to 1.25 mm wide; fruits ovoid-globose, 3.5 to 4 mm long, 2.75 to 3.5 mm in diameter.

MINDORO, Pinamalayan, *Bur. Sci. 41073 Ramos.* MINDANAO, Surigao Province, Surigao, *Bur. Sci. 34763 Ramos and Pascasio:* Agusan Province, Cabadbaran, Mount Urdaneta, *Elmer 14008:* Lanao Province, Camp Keithley, Lake Lanao, *Clemens s. n.*, Sept. 1906, (type of *Piper caninum* Blume var. *lanaoense* C. DC. in herb. Manila). JOLO, Bud-wak, *Link C–7.* CAMIGUIN DE MINDANAO, Mount Volcano, *Bur. Sci. 14672 Ramos.* In thickets and second-growth forests, at low and medium altitudes. Endemic.

This differs from the previous variety by its pubescence and form of the leaves.

Var. OBLONGIFOLIUM var. nov. Text figs. 62, 7; 64, 6; 65, 4.

Ramuli glabris ad sparse puberulis; foliis oblongis, 14 ad 17.5 cm longis, 4 ad 6.5 cm latis, basi subequilateralibus subobtusis, 7-plinerviis, apice obtuse acuminatis; bracteis subsessilibus, peltatis, peltis suborbicularis, 1 ad 1.25 mm latis; fructibus submaturis ovoideis, 4 ad 4.5 mm longis, 3 ad 3.5 mm diametro.

Branches glabrous to sparsely puberulent. Leaves oblong, 14 to 17.5 cm long, 4 to 6.5 cm wide, base subequilaterally subobtuse, 7-plinerved, apex obtusely acuminate, sparsely hirtellous on the nerves above, sparsely hirsute beneath. Pistillate spikes 1.5 to 2.5 cm long; the peduncles sparsely puberulent, 1.5 to 1.8 cm long; bracts subsessile, peltate, disk suborbicular, 1 to 1.25 mm wide; submature fruits ovoid, 4 to 4.5 mm long, 3 to 3.5 mm in diameter.

BUCAS GRANDE, *Bur. Sci. 35070 Ramos and Pascasio* (type of the variety in herb. Manila), June 8, 1919, in open forests at low altitudes.

Notwithstanding the marked foliar differences indicated, this plant shows such resemblances to *Piper caninum* Blume in inflorescence and other characters as to discourage its treatment as an independent species.

Var. HALLIERI (C. DC.) comb. nov. Text figs. 63, 1–2; 64, 7; 65, 5.

Piper hallieri C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 458, Candollea 1 (1923) 225; MERR., Enum. Philip. Fl. Pl. 2 (1923) 9.

Branches sparsely hirsute. Leaves elliptic-lanceolate to elliptic-ovate, 10 to 13.5 cm long, 3 to 6.3 cm wide, base equilaterally acute, 5- to 7-plinerved, apex acutely acuminate, sparsely hirtellous on the nerves and parenchyma above, densely hirsute and

FIG. 63. *Piper caninum* Blume; *7*, pistillate spike; *8*, leaves. Var. *hallieri* (C. DC.) comb. nov.; *1–2*, leaves. Var. *latibracteum* C. DC.; *3–6*, leaves. All × 0.3.

glaucous beneath. Pistillate spikes 5 to 6.5 cm long; the peduncles sparsely hirsute, 2 to 2.5 cm long; bracts subsessile, peltate, disk orbicular to suborbicular, 0.75 to 1 mm wide; fruits obovoid-globose, 2.5 to 3.25 mm long, 2 to 2.25 mm in diameter, the pedicels up to 2.75 mm long.

BASILAN, *Hallier s. n.*, Jan., 1904 (type of *Piper hallieri* C. DC., in herb. Manila). Endemic.

Piper hallieri C. DC., which I have reduced as a variety, unquestionably belongs to the *Piper caninum* group and resembles somewhat *Piper dipterocarpinum* C. DC., differing in its pubescent leaves and much longer pistillate spikes.

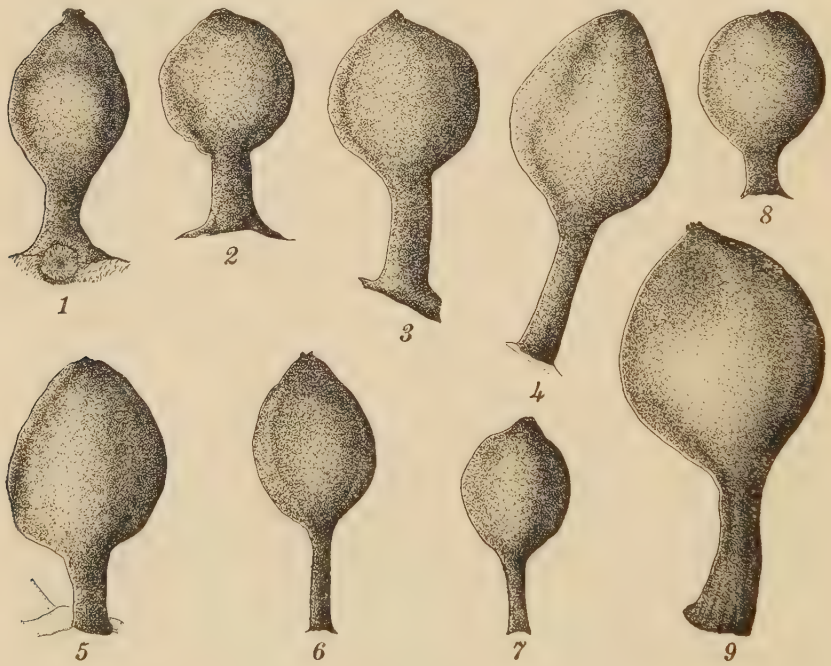

FIG. 64. Fruits of: *1–3*, *Piper caninum* Blume; *4*, var. *glabribracteum* C. DC.; *5*, var. *lanaoense* C. DC.; *6*, var. *oblongifolium* var. nov.; *7*, var. *hallieri* (C. DC.) comb. nov.; *8*, var. *basilanum* (C. DC.) comb. nov.; *9*, var. *latibracteum* C. DC. All × 5.

Var. BASILANUM (C. DC.) comb. nov. Text figs. 62, 8-9; 64, 8; 65, 6.

Piper basilanum C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 457, Candollea 1 (1923) 226; MERR., Enum. Philip. Fl. Pl. 2 (1923) 4.

Branches glabrous, branchlets sparsely pilose. Leaves ovate to ovate-lanceolate, 8.5 to 11 cm long, 2.5 to 5 cm wide, base subequilaterally subrounded to rounded, 5-plinerved, apex obtusely acuminate, sparsely pubescent on the nerves and paren-

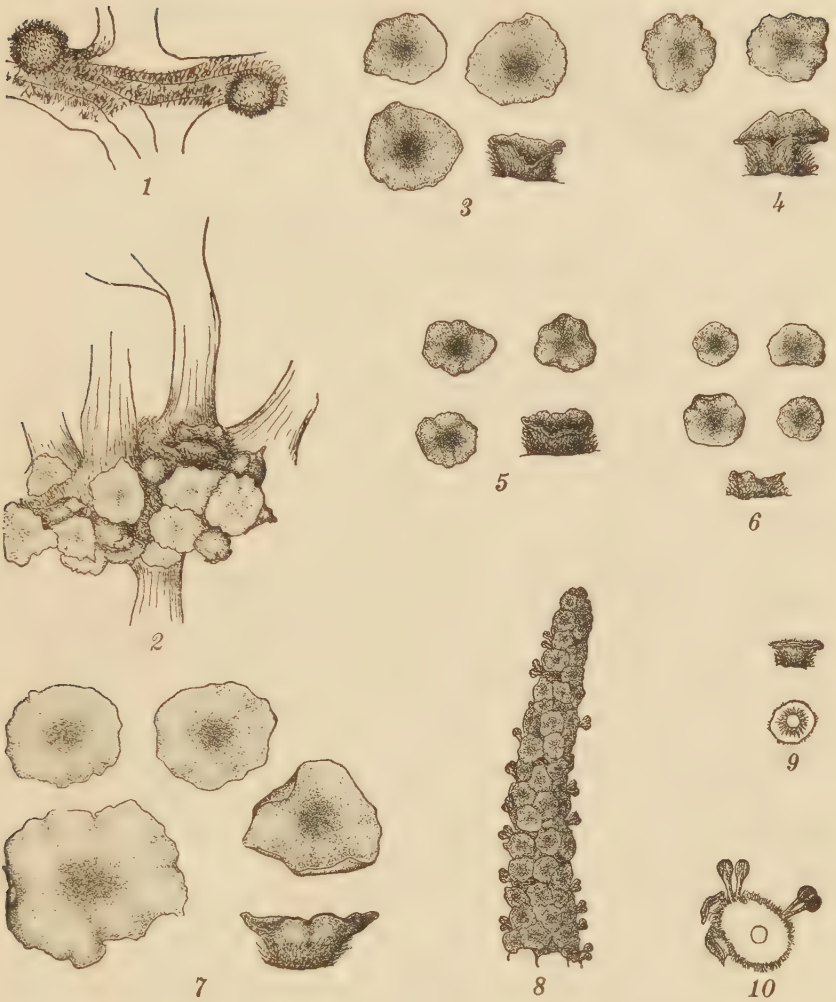

FIG. 65. *Piper caninum* Blume; *1*, portion of the pistillate spike showing bracts and rachis, × 7.5; *8*, apex of staminate spike, × 7.5; *9*, side and lower views of staminate bracts, × 7.5; *10*, transverse section of staminate spike, × 7.5. Var. *glabribracteum* C. DC.; *2*, portion of pistillate spike showing bracts, rachis and fruit pedicels, × 7.5. Var. *lanaoense* C. DC.; *3*, top and side views of pistillate bracts, × 10. Var. *oblongifolium* var. nov.; *4*, top and side views of pistillate bracts, × 10. Var. *hallieri* (C. DC.) comb. nov.; *5*, top and side views of pistillate bracts, × 10. Var. *basilanum* (C. DC.) comb. nov.; *6*, top and side views of pistillate bracts, × 10. Var. *latibracteum* C. DC.; *7*, top and side views of pistillate bracts, × 10.

chyma above, densely hirsute and glaucous beneath. Pistillate spikes 2 to 2.5 cm long; the peduncles glabrous, 1.8 to 2 cm long; bracts subsessile, peltate, disk orbicular, 0.5 to 0.75 mm wide; fruits subglobose, 3 to 3.5 mm long, 2.25 to 2.75 mm in diameter, the pedicels up to 1 mm long.

BASILAN, *Hallier s. n.*, Jan., 1904 (type of *Piper basilanum* C. DC. in herb. Manila). Endemic.

A variety very closely allied to *Piper caninum* Blume var. *hallieri* (C. DC.) Quis., but differing conspicuously in its relatively shorter pedicels.

Var. LATIBRACTEUM C. DC. Text figs. 63, 3-6; 64, 9; 65, 7.

Piper caninum Blume var. *latibracteum* C. DC. in Leafl. Philip. Bot. 3 (1910) 787, Philip. Journ. Sci. 5 (1910) Bot. 459, Candollea 1 (1923) 226; MERR., Enum. Philip. Fl. Pl. 2 (1923) 6.

Branches densely villose. Leaves ovate, 8.7 to 13.3 cm long, 4 to 7.2 cm wide, base equilaterally to subequilaterally subacute to obtuse, lower leaves cordate, 7-plinerved, apex long and acutely acuminate, sparsely pubescent above, densely pubescent beneath. Pistillate spikes 2.3 to 5 cm long; the peduncles villose, 1.5 to 2.5 cm long; bracts sessile to subsessile, peltate, disk orbicular, 1.25 to 2 mm wide; fruits ovoid-globose, 5 to 6 mm long, 3.5 to 4.75 mm in diameter.

LUZON, Benguet Subprovince, Baguio, *Elmer 8844:* Nueva Ecija Province, Mount Umingan, *Bur. Sci. 26502 Ramos and Edaño:* Tayabas Province, Lucban, *Elmer 7990* (type collection of *Piper caninum* Blume var. *latibracteum* C. DC.). On stream banks and in forests at medium altitudes, and ascending to 1,300 meters. Endemic.

A variety close to *Piper sablanum* (C. DC.) Quis., differing in its villose branches, petioles, and peduncles, its leaves being pubescent on both surfaces, and in its large, ovoid-globose fruits.

54. PIPER VIMINALE Opiz. Text figs. 66 and 67.

Piper viminale OPIZ in Presl. Rel. Haenk. 1 (1828) 150, *t. 26, f. 1;* MIQ., Syst. Pip. (1843) 336; C. DC., Prodr. 16^1 (1869) 337, Philip. Journ. Sci. 5 (1910) Bot. 436, 11 (1916) Bot. 217, Candollea 1 (1923) 197; F.-VILL., Novis. App. (1880) 176; MERR., Enum. Philip. Fl. Pl. 2 (1923) 17.

Chavica? viminalis MIQ., in Linnaea 20 (1847) 131, Fl. Ind. Bat. 1^2 (1858–59) 445.

Piper negrosense C. DC. in Leafl. Philip. Bot. 3 (1910) 786, Philip. Journ. Sci. 5 (1910) Bot. 454, Candollea 1 (1923) 222; MERR., Enum. Philip. Fl. Pl. 2 (1923) 17.

Piper marivelesanum C. DC. in Perk. Frag. Fl. Philip. (1905) 155, Leafl. Philip. Bot. 3 (1910) 787, Philip. Journ. Sci. 5 (1910) Bot. 457, 11 (1916) Bot. 224, Candollea 1 (1923) 221, 223, 226; MERR., Enum. Philip. Fl. Pl. 2 (1923) 11.

Piper tenuirameum C. DC. in Perk. Frag. Fl. Philip. (1905) 159, Philip. Journ. Sci. 5 (1910) Bot. 456, Candollea (1923) 281; MERR., Enum. Philip. Fl. Pl. 2 (1923) 16.

Piper parcipilum C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 445, Candollea 1 (1923) 211; MERR., Enum. Philip. Fl. Pl. 2 (1923) 5.

A dicœcious vine; the young branches hirtellous, older ones glabrous, terete, 1 to 2.5 mm in diameter. Leaves chartaceous, in the male narrowly linear to narrowly oblong-ovate or narrowly ovate-lanceolate, 3.5 to 14.5 cm long, usually 0.5 to 2 cm wide, in the lower leaves up to 4.5 cm wide, in the female oblong-ovate to oblong-lanceolate, 6 to 14.5 cm long, 2 to 6 cm wide, lower leaves in both male and female ovate-lanceolate to ovate, base equilaterally to inequilaterally subacute to rounded, 3- to 5-plinerved, in the lower leaves in both male and female usually subrounded to cordate, narrowed to the subobtuse apex, in the male glabrous on both surfaces to hirtellous on the midrib of one or both surfaces to rarely hirtellous on the nerves beneath, in the female glabrous to hirtellous on the nerves above, hirsute beneath or on the nerves only, reticulations somewhat obscure above, more or less prominent beneath; petioles hirtellous, 2 to 10 mm long, in the lower leaves up to 30 mm in length. Pistillate spikes 1.5 to 4 cm long, 1 to 1.5 cm in diameter; the peduncles hirtellous, 12 to 25 mm long, rarely 30 mm long; rachis hirsute; bracts sessile to subsessile, fleshy, peltate, disk glabrous above, ciliate on the margins, orbicular, 0.75 to 1 mm wide; fruits pedicellate, ovoid to globose, 3 to 4.5 mm long, 2.5 to 4 mm in diameter, glabrous, the pedicels up to 5 mm long; stigmas 3 or 4, ovoid, acute, sessile, apical. Staminate spikes slender, 7.5 to 15 mm long, 1 to 1.5 mm in diameter; the peduncles hirtellous, 5 to 11 mm long; rachis densely hirsute; bracts subsessile, fleshy, peltate, disk glabrous above, ciliate on the margins, orbicular, 0.5 to 1 mm wide; stamens 2, pedicellate, anthers small, ovoid, bilocular, 2-valved, filaments longer than the anthers, slender, exerted.

LUZON, without definite locality, *Haenke s. n.* (type of *Piper viminale* Opiz, in herb. Prague) : Isabela Province, Peñablanca, *Warburg 12126;* San Mariano, *Bur. Sci. 46989 Ramos and Edaño:* Pangasinan Province, Mount San Isidro, *Bur. Sci. 29913 Fénix:* Benguet Subprovince, Sablan, *Elmer 6161;* Baguio, *Elmer 8886:* Zambales Province, Subic, *Bur. Sci. 38315 Edaño:* Bataan Province, Mount Mariveles, *Warburg 13640* (type collection of *Piper marivelesanum* C. DC.), *Merrill 3727, Williams 227, 369, 370, Whitford 1060, For. Bur. 165 Barnes, 1756 Borden, 2507 Meyer;* Dinalupihan, *Merrill 1579;* Limay, *For. Bur. 19158 Curran:* Bulacan Province, Angat, *Bur. Sci. 34036 Ramos and*

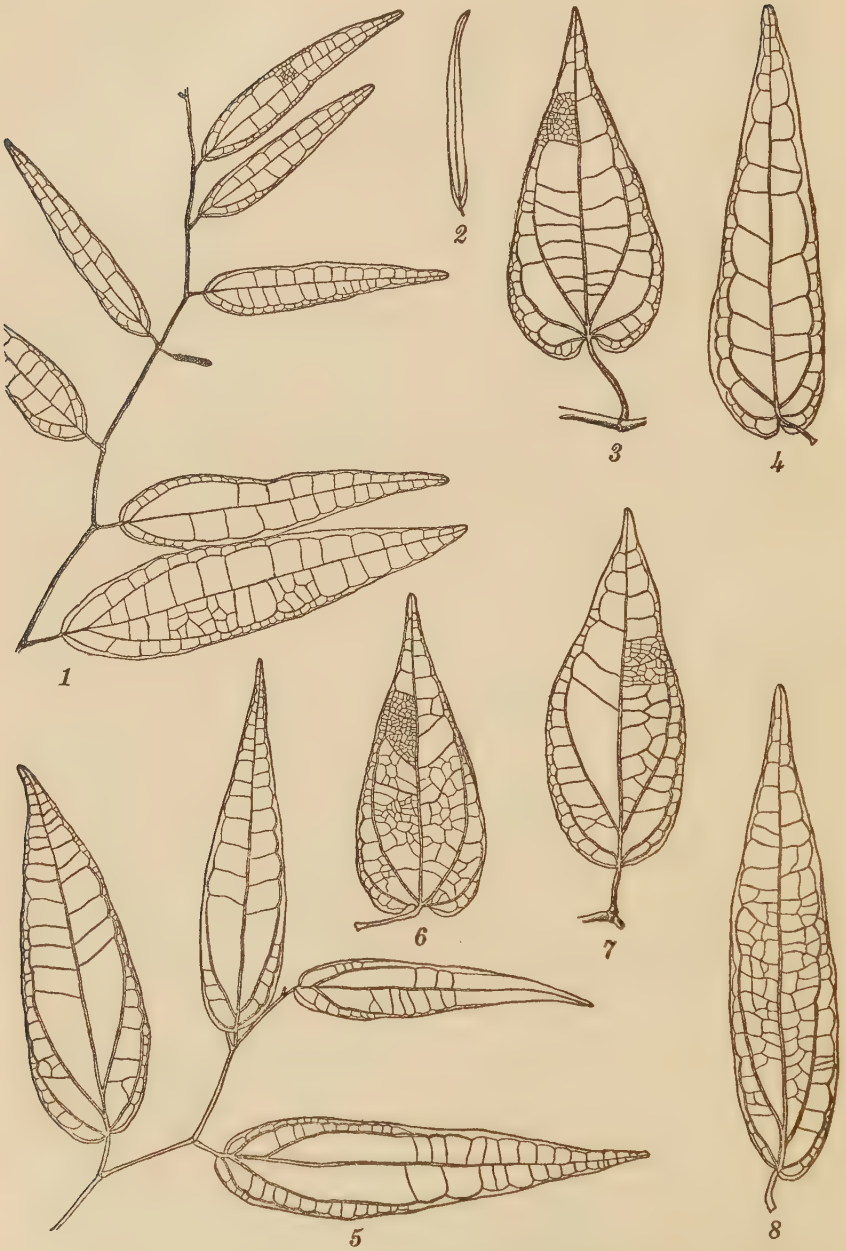

FIG. 66. *Piper viminale* Opiz; *1*, branch of the male plant; *2*, upper leaf of male plant; *3*, lower leaf; *4*, leaf; *5*, branch of the female plant; *6*, lower leaf; *7–8*, leaves. All × 0.5.

Edaño: Rizal Province, Bosoboso, *Bur. Sci. 1115 Ramos;* Binangonan, *Warburg 13317* (type collection of *Piper tenuirameum* C. DC.) : Laguna Province, San Antonio, *Bur. Sci. 10952, 12021,*

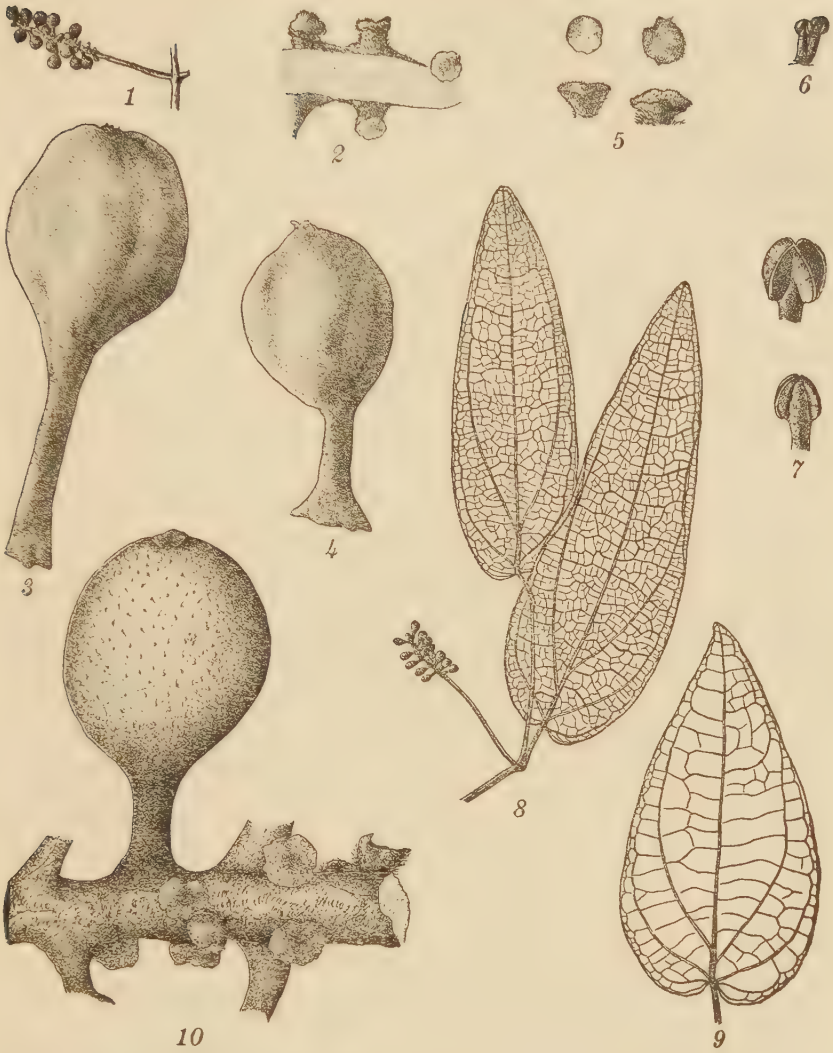

FIG. 67. *Piper viminale* Opiz; *1*, pistillate spike, × 0.5; *2*, portion of rachis of pistillate spike, × 7.5; *3–4*, fruits, × 7.5; *5*, top and side views of staminate bracts, × 10; *6*, two stamens, × 10; *7*, anthers, after and before dehiscence, very much enlarged. *Piper apoanum* C. DC.; *8*, fruiting branch, × 0.5; *9*, lower leaf, × 0.5; *10*, portion of pistillate spike, × 7.5.

20408 Ramos; near Fami, *Bur. Sci. 22963 McGregor;* Paete, *Bur. Sci. 22774, 23009 McGregor:* Tayabas Province, Tagcauayan, *Bur. Sci. 13349 Ramos;* Dolores, *For. Bur. 30063 Sulit;* Lucban-Mauban road, *Bur. Sci. 47392 McGregor;* Infanta-Siniloan trail, *Bur. Sci. 29194 Ramos and Edaño:* Camarines Norte Province,

Niog, Sagnay, *Bur. Sci. 22133 Ramos;* Paracale, *Bur. Sci. 33690 Ramos and Edaño:* Camarines Sur Province, Maagnas, *Bur. Sci. 6327 Ramos:* Sorsogon Province, Irosin, Mount Bulusan, *Elmer 16944.* POLILLO, Mount Malulud, *Bur. Sci. 9213 Robinson;* Barrio Saloang, *For. Bur. 29665 Salvoza.* CATANDUANES, Mount Mariguidon, *Bur. Sci. 30241, 30513 Ramos and Chan;* Santo Domingo River, *Bur. Sci. 30560 Ramos and Chan.* MINDORO, Bongabong River, Camantigue, *For. Bur. 3668 Merritt;* Mount Calavite, *Bur. Sci. 39407 Ramos and Lopez;* Paluan, *Bur. Sci. 39672 Ramos and Lopez.* SAMAR, Mount Canislagan, *Bur. Sci. 17508 Ramos;* Camaniwan, Catubig River, *Bur. Sci. 24260 Ramos.* LEYTE, Dagami, *Wenzel 307;* Jaro, Buenavista, *Wenzel 856;* Tigbao, Tacloban, *Wenzel 1618.* PANAY, Antique Province, Culasi, *Bur. Sci. s. n. McGregor* (field No. *McGregor 5711*) : Capiz Province, Magallanes, Mount Giting-giting, *Elmer 12212;* Jamindan, *Bur. Sci. 31131, 31266, 31339 Ramos and Edaño.* NEGROS, Negros Oriental Province, Dumaguete, Cuernos Mountains, *Elmer 9482* (type collection of *Piper negrosense* C. DC.). PALAWAN, Malampaya, *Merrill 7213.* MINDANAO, Surigao Province, Surigao, *Piper 244, Bur. Sci. 34389 Ramos and Pascasio;* Placer, *Wenzel 2785, 3099:* Agusan Province, Cabadbaran, Mount Urdaneta, *Elmer 14253:* Davao Province, Davao, *Copeland 501:* Lanao Province, Camp Keithley, Lake Lanao, *Clemens s. n.* 1906 (type of *Piper parcipilum* C. DC. in herb. Manila) : Zamboanga Province, Malangas, *Bur. Sci. 37105 Ramos and Edaño.* BUCAS GRANDE, *Bur. Sci. 35080 Ramos and Pascasio.* CAMIGUIN DE MINDANAO, *Bur. Sci. 14645, 14676, 14685, 14699 Ramos.* In thickets and forests at low and medium altitudes, ascending to 1,000 meters. Endemic.

Local names: Buyók-hálo (P. Bis.) ; lauiñgan (Sub.) ; lauiñgan-ihalas (Bis.) ; litlít-matsing (Tag.) ; súbong-manók (Tag.) ; subú-manók (Tag.) ; tubóg-manók (Tag.).

This species is clearly allied to *Piper caninum* Blume, but differs in the form and size of its leaves, particularly the male plant. The female plant is more similar to Blume's species, differing in the form of its leaves and its pistillate fleshy bracts, which are sometimes subsessile; *Piper negrosense* C. DC. is unquestionably the same as *Piper viminale* Opiz. Likewise, *Piper marivelesanum* C. DC., *Piper tenuirameum* C. DC., and *Piper parcipilum* C. DC. are not distinct from *Piper viminale* Opiz, as herewith interpreted.

55. PIPER APOANUM C. DC. Text fig. 67, 8–10.

Piper apoanum C. DC. in Leafl. Philip. Bot. 3 (1910) 785, Philip. Journ. Sci. 5 (1910) Bot. 454, Candollea 1 (1923) 222; MERR., Enum. Philip. Fl. Pl. 2 (1923) 3.

A dicœcious vine; the branches glabrous, terete, 1.5 to 2 mm in diameter. Leaves chartaceous, oblong-ovate, 10.5 to 14.5 cm long, 3.2 to 5.5 cm wide, base equilaterally to subequilaterally subcordate, the lower leaves cordate, 5-plinerved, narrowed to the obtuse apex, glabrous on both surfaces, reticulations somewhat obscure on both surfaces; petioles puberulent, 8 to 12 mm long. Pistillate spikes somewhat pendulous, 2 to 3 cm long, 10 to 13 mm in diameter; the peduncles glabrous, about 3 cm long; rachis hirtellous; bracts subsessile, peltate, 0.5 to 0.75 mm wide, disk glabrous above and on the margins, fleshy, orbicular, 0.75 to 1 mm wide, pedicels stout, fleshy, densely and minutely hirtellous; fruits pedicellate, not crowded, subglobose, 3 to 4 mm long, 3 to 3.5 mm in diameter, glandular, puberulent, black when dry, the pedicels sparingly hirtellous, up to 2 mm in length; stigmas 3, ovoid, sessile, apical.

MINDANAO, Davao Province, Mount Apo, *Elmer 11174* (type collection), in thickets, altitude about 800 meters. Endemic.

Local name: Manikatápai (Bag.).

This species is close to *Piper viminale* Opiz, but differs in its leaves with subcordate to cordate bases, its puberulent fruits, and hirtellous rachis.

56. PIPER DENSIBACCUM C. DC. Text fig. 68.

Piper densibaccum C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 454, Candollea 1 (1923) 222; MERR., Enum. Philip. Fl. Pl. 2 (1923) 5.

A dicœcious vine; the branches tomentose, terete, 1.5 to 2.5 mm in diameter. Leaves chartaceous, oblong, 7.5 to 11 cm long, 2.7 to 4.5 cm wide, base equilaterally to subequilaterally acute to obtuse, 5-plinerved, apex obtusely acuminate, glabrous on both surfaces, reticulations more or less prominent on both surfaces; petioles tomentose, 10 to 13 mm long, in the lower leaves up to 30 mm in length. Pistillate spikes pendulous, 2.5 to 4 cm long, about 1.3 cm in diameter; the peduncles glabrous, 1.7 to 2 cm long; rachis densely hirsute; bracts subsessile, peltate, disk glabrous above and on the margins, membranaceous, orbicular, 1 to 1.25 mm wide; fruits pedicellate, crowded, ellipsoid to subglobose, 3 to 4 mm long, 2.5 to 3.5 mm in diameter, glabrous, black when dry, the pedicels glabrous, up to 2.5 mm long; stigmas 3 or 4, ovoid, sessile, apical.

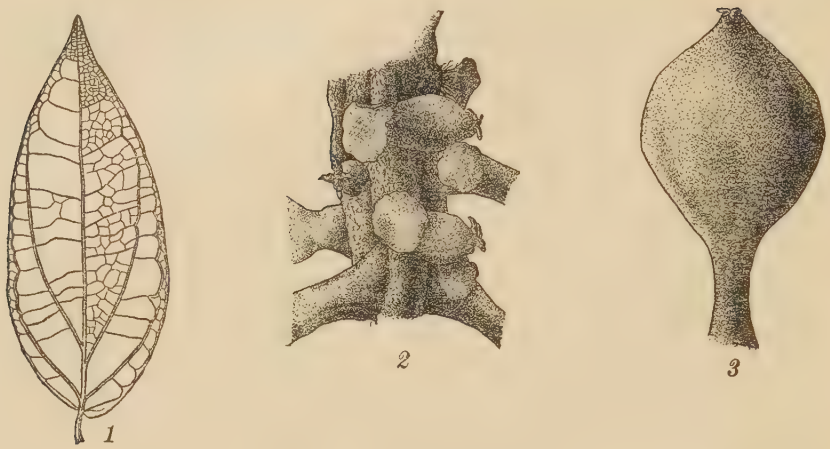

FIG. 68. *Piper densibaccum* C. DC.; *1*, leaf, × 0.5; *2*, portion of the pistillate spike, × 7.5; *3*, fruit, × 7.5.

MINDANAO, Lanao Province, Camp Keithley, Lake Lanao, *Clemens s. n.*, 1906 (type in herb. Manila). Endemic.

In some respects this resembles *Piper apoanum* C. DC., differing in its oblong leaves, ellipsoid to subglobose, glabrous fruits, and its tomentose branches.

57. PIPER DAGATPANUM C. DC. Text fig. 69.

Piper dagatpanum C. DC. in Perk. Frag. Fl. Philip. (1905) 154, Philip. Journ. Sci. 5 (1910) Bot. 455, Candollea 1 (1923) 223; MERR., Enum. Philip. Fl. Pl. 2 (1923) 7.

A dicœcious vine; the branches glabrous, terete, 1.5 to 2 mm in diameter. Leaves chartaceous, oblong-ovate, 10.5 to 14.5 cm long, 3.5 to 7.5 cm wide, lower leaves ovate, base inequilaterally subacute to subrounded, in the lower leaves subcordate, 7-plinerved, apex acute, glabrous on both surfaces, reticulations somewhat obscure on both surfaces; petioles glabrous, 1.3 to 1.8 cm long. Pistillate spikes pendulous, 5 to 6.5 cm long, 1.2 to 1.4 cm in diameter; the peduncles glabrous, 2 to 2.5 cm long; rachis hirsute; bracts sessile, peltate, disk glabrous above and on the margins, membranaceous, oblong-obovate to orbicular, 0.75 to 1 mm wide; fruits pedicellate, somewhat remote, subglobose, 4 to 5.5 mm long, 3.5 to 4 mm in diameter, glabrous, reddish black when dry, the pedicels sparingly hirtellous at the base, up to 3 mm long; stigmas 4, oblong, sessile, apical.

MINDANAO, Davao Province, Mount Dagatpan, *Warburg 14739* (type in herb. Berlin; isotype in herb. Manila): Zamboanga

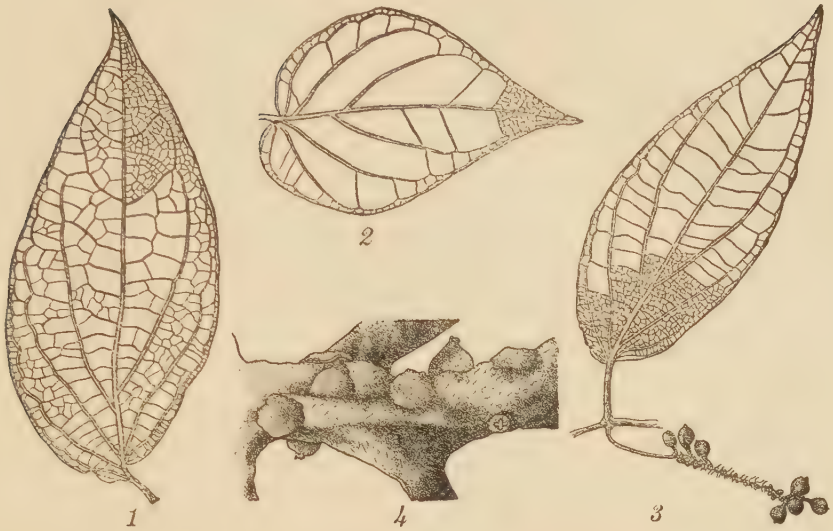

FIG. 69. *Piper dagatpanum* C. DC.; *1*, leaf, × 0.5; *2*, lower leaf, × 0.5; *3*, leaf and pistillate spike, × 0.5; *4*, portion of the pistillate spike, × 7.5.

Province, Sibulan, *Warburg 14738*. In forests, altitude about 1,300 meters. Endemic.

This species possesses the habit and many characteristics of *Piper apoanum* C. DC., occurs in the same region, and is doubtless related to it. However, it differs in its acute leaves, and glabrous petioles, bracts, and fruits.

58. **PIPER DIPTEROCARPINUM** C. DC. Text fig. 70.

Piper dipterocarpinum C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 455, Candollea 1 (1923) 222; MERR., Enum. Philip. Fl. Pl. 2 (1923) 8.
Piper malindangense C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 436, Candollea 1 (1923) 195; MERR., Enum. Philip. Fl. Pl. 2 (1923) 11.

A dicœcious vine; the branches glabrous, terete, 1.25 to 2 mm in diameter. Leaves chartaceous, oblong-elliptic, 10 to 12.7 cm long, 2.5 to 5 cm wide, lower leaves ovate, base equilaterally to subequilaterally acute, 5- to 7-plinerved, apex long and acutely acuminate, glabrous on both surfaces, reticulations somewhat obscure on both surfaces; petioles glabrous, 4 to 13 mm long. Pistillate spikes suberect, 2 to 3 cm long, about 1 cm in diameter; the peduncles glabrous, about 1.3 cm long; rachis densely hirsute; bracts sessile, peltate, disk glabrous above and on the margins, orbicular, about 0.75 mm wide; fruits pedicellate, somewhat crowded, subglobose, about 3 mm long, 2.5 mm in diameter, glabrous, glandular, the pedicels glabrous and spar-

FIG. 70. *Piper dipterocarpinum* C. DC.; *1*, leaf, × 0.5; *2*, fruiting branch of pistillate plant, × 0.5; *3*, leaf and staminate spike, × 0.5; *4*, portion of pistillate spike, × 7.5; *5*, portion of staminate spike, × 7.5; *6*, side and top views of staminate bracts, × 10; *7*, stamen, before dehiscence, × 10; *8*, stamens, after dehiscence, × 10.

ingly glandular, up to 3 mm in length; stigmas 4 or 5, lanceolate, apex acute, sessile, apical. Staminate spikes suberect, slender, 2 to 5 cm long, 1.25 to 2 mm in diameter; the peduncles glabrous, 2 to 7 mm long; rachis hirsute; bracts pedicellate, peltate, 0.3 to 0.5 mm long, disk glabrous above and on the margins, crenate, orbicular, 0.75 to 1.25 mm wide; stamens 2, pedicellate, about 0.75 mm long, anthers oblong or subglobose, 2-valved, filaments exerted.

MINDANAO, Misamis Province, Mount Malindang, *For. Bur. 4758 Mearns and Hutchinson* (type of *Piper malindangense* C. DC. in herb. Manila): Lanao Province, Camp Keithley, Lake Lanao, *Clemens s. n.*, 1906: Zamboanga Province, Banga, *For. Bur. 9146 Whitford and Hutchinson* (type of *Piper dipterocarpinum* C. DC. in herb. Manila). BASILAN, Binauangan, *Bur. Sci. 15465 Reillo.* In forests at low altitudes. Endemic.

This species is allied to *Piper caninum* Blume, from which it is distinguished by its oblong-elliptic leaves, which are glabrous on both surfaces; by its pistillate bracts, which are glabrous on the surfaces and on the margins, and by its much longer staminate spikes.

59. PIPER SABLANUM (C. DC.) comb. nov. Text fig. 71.

Piper caninum Blume. var. *sablanum* C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 459, Candollea 1 (1923) 244; MERR., Enum. Philip. Fl. Pl. 2 (1923) 6.

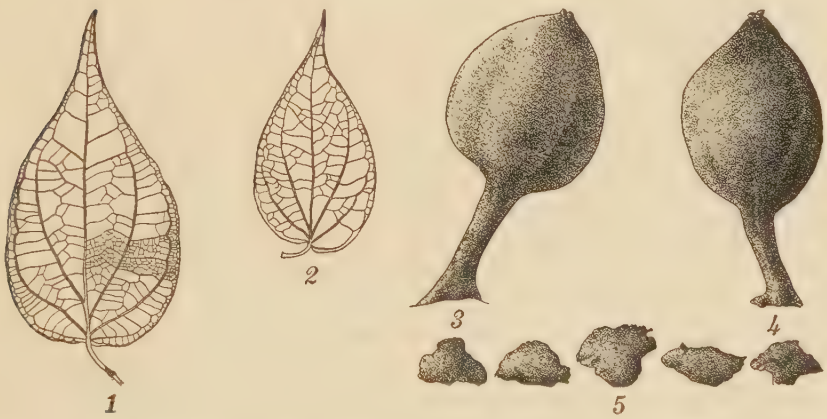

FIG. 71. *Piper sablanum* (C. DC.) comb. nov.; *1–2*, leaves, × 0.3; *3–4*, fruits, × 5; *5*, top and side views of pistillate bracts, × 5.

A dicœcious vine; the branches usually glabrous, rarely hirtellous, terete, 2 to 3 mm in diameter. Leaves chartaceous, ovate, 8 to 13.5 cm long, 4.5 to 7 cm wide, base equilaterally to subequilaterally rounded, 7-plinerved, apex long and acutely acuminate, glabrous above, sparsely hirsute beneath, reticulations somewhat prominent on both surfaces; petioles hirtellous, 10 to 15 mm long, in the lower leaves up to 30 mm in length. Pistillate spikes 2.5 to 3 cm long, 1.8 to 2 cm in diameter; the peduncles glabrous to sparsely hirtellous, 2 to 3 cm long, rarely 1 cm long;

rachis hirsute; bracts subsessile, peltate, disk glabrous above and on the margins, transversely elliptic, 1.75 to 2.1 mm long, 1.25 to 1.75 mm wide; fruits pedicellate, ovoid-globose, 5 to 7 mm long, 4 to 4.5 mm in diameter, glabrous, black when dry, the pedicels glabrous, up to 5 mm in length; stigmas 3 or 4, ovoid, sessile, apical.

LUZON, Abra Province, Mount Posuey, *Bur. Sci. 27006 Ramos:* Benguet Subprovince, Sablan, *Elmer 6150* (type of *Piper caninum* Blume var. *sablanum* C. DC. in herb. Manila): Pampanga Province, Mount Pinatubo, *Clemens 17377.* In forests at medium altitudes. Endemic.

This species is in its less significant features close to *Piper sorsogonum* C. DC., but differs in its free, peltate bracts and shorter spikes, and in having leaves with long apices. It differs from *Piper caninum* Blume in its ovate leaves, larger fruits, and its larger, glabrous bracts.

60. PIPER TENUIPEDUNCULUM C. DC. Text fig. 72.

Piper tenuipedunculum C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 460, Candollea 1 (1923) 224; MERR., Enum. Philip. Fl. Pl. 2 (1923) 16.

A diœcious vine; the branches villose, terete, 1.25 to 2 mm in diameter. Leaves thinly chartaceous, oblong-ovate to ovate, 12.5 to 14.5 cm long, 5.5 to 7.3 cm wide, base subequilaterally cordate, 9-plinerved, apex obscurely and acutely acuminate, sparsely hirtellous above, hirsute beneath, reticulations somewhat prominent on both surfaces; petioles densely hirsute, 1.5 to 2.7 cm long. Pistillate spikes pendulous, about 6 cm long, 1 to 1.2 cm in diameter; the peduncles long and slender, sparsely hirsute, about 5 cm long; rachis slender, hirsute; bracts sessile, peltate, disk membranaceous, glabrous above and on the margins, obovate, 0.75 to 1 mm wide; fruits pedicellate, remote, elliptic-oblong to oblong, about 3 mm long, 2 mm in diameter, rounded, glabrous, the pedicels up to 2 mm long; stigmas 3 or 4, linear, acute, sessile, apical.

MINDANAO, Zamboanga Province, San Ramon, *Williams 2343* [8] p. p. (type in herb. Manila), in forests, altitude about 100 meters. Endemic.

This species resembles *Piper haenkeanum* Opiz in its vegetative characters, but differs conspicuously in its long and slender peduncles, reaching a length of 5 cm.

[8] This number is in part *Piper haenkeanum* Opiz.

FIG. 72. *Piper tenuipedunculum* C. DC.; *1*, leaf, × 0.5; *2*, apical portion of branch, showing leaf and peduncle, × 0.5; *3*, top view of pistillate bracts, × 10; *4–5*, fruits, × 7.5.

61. PIPER MALALAGANUM C. DC. Text fig. 73.

Piper malalaganum C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 461, Candollea 1 (1923) 227; MERR., Enum. Philip. Fl. Pl. 2 (1923) 11.

A dicœcious vine; the branches densely hirsute, terete, 1.5 to 3 mm in diameter. Leaves thinly chartaceous, oblong-elliptic to oblong-ovate, 8.5 to 12 cm long, 3.7 to 6 cm wide, base subequilaterally acute to obtuse, 7- to 9-plinerved, apex subacutely acuminate, sparsely hirsute above, densely hirsute beneath, reticulations somewhat prominent beneath; petioles densely hirsute, 11 to 13 mm long, in the lower leaves up to 20 mm in length. Pistillate spikes suberect, about 10.5 cm long, 1.5 cm in diameter; the peduncles sparsely hirsute, about 2 cm long; rachis hirsute; bracts sessile, peltate, disk glabrous above and on the margins,

FIG. 73. *Piper malalaganum* C. DC.; *1*, branch, × 0.3; *2–3*, leaves, × 0.3; *4*, pistillate spike, × 0.3; *5*, top view of pistillate bracts, × 5; *6*, portion of pistillate spike, × 5; *7*, fruit, × 5.

membranaceous, oblong-ovate 1.25 to 1.5 mm wide; fruits pedicellate, somewhat remote, ellipsoid, 5 to 6.5 mm long, 3 to 3.5 mm in diameter, glabrous, dark brown, the pedicels glabrous, up to 3 mm in length; stigmas 4, ovoid, sessile, apical.

MINDANAO, Davao Province, Malalag, *Copeland 696* (type in herb. Manila). Endemic.

This species is certainly close to *Piper haenkeanum* Opiz, from which it may be distinguished by its branches, petioles, and peduncles not densely villose and the upper surface of the leaves pubescent on the nerves only.

62. PIPER HAENKEANUM Opiz. Text fig. 74.

Piper haenkeanum OPIZ in Presl Rel. Haenk. 1 (1828) 159; C. DC. Prodr. 16[1] (1869) 377, Philip. Journ. Sci. 5 (1910) Bot. 462; F.-VILL., Novis. App. (1880) 176; MERR., Enum. Philip. Fl. Pl. 2 (1923) 9.

Piper merrittii C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 460, 11 (1916) Bot. 224, Candollea 1 (1923) 225; MERR., Enum. Philip. Fl. Pl. 2 (1923) 12.

Piper obovatibracteum C. DC. in Leafl. Philip. Bot. 3 (1910) 784, Philip. Journ. Sci. 5 (1910) Bot. 447, 11 (1916) Bot. 221, Candollea 1 (1923) 207; MERR., Enum. Philip. Fl. Pl. 2 (1923) 13.

Piper villilimbum C. DC. in Leafl. Philip. Bot. 3 (1910) 788, Philip. Journ. Sci. 5 (1910) Bot. 461, 11 (1916) Bot. 224, Candollea 1 (1923) 226; MERR., Enum. Philip. Fl. Pl. 2 (1923) 17.

A dicœcious vine; the branches densely villose, terete, 1.5 to 3 mm in diameter. Leaves thinly chartaceous to chartaceous, oblong-ovate, oblong-lanceolate, elliptic-ovate or ovate-lanceolate, the lower leaves heart-shaped, 8.5 to 20 cm long, 4 to 9 cm wide, in the male as short as 6 cm long, and as narrow as 1.5 cm, the lower leaves of the female attaining a width up to 12 cm, base equilaterally to inequilaterally acute, obtuse to subrounded, the lower leaves cordate, 5- to 7-plinerved, apex acutely acumi-

FIG. 74. *Piper haenkeanum* Opiz; *1–2*, leaves, × 0.3; *3*, branch of a male plant, × 0.3; *4*, leaf, × 0.3; *5–6*, lower leaves, × 0.3; *7–10*, fruits, × 5; *11*, top, lower, and side views of pistillate bracts, × 6.5; *12*, portion of staminate spike, × 6.5; *13*, top view of staminate bracts, × 6.5.

nate to acute, densely villose on both surfaces, margins usually villose, reticulations somewhat obscure above, more or less prominent beneath; petioles densely villose, 7 to 18 mm long, in the lower leaves up to 60 mm in length. Pistillate spikes 6 to 15.5 cm long, 1.3 to 1.8 cm in diameter; the peduncles densely villose, 1.5 to 2.5 cm long; rachis slender, hirsute, 1 to 1.5 mm in diameter; bracts sessile to subsessile, peltate, disk glabrous above and on the margins, orbicular, 0.75 to 1 mm wide; fruits pedicellate, not crowded, ovoid-globose to globose, glabrous, 3 to 4 mm long, 2.5 to 4 mm in diameter, the pedicels up to 4 mm in length; stigmas 3 or 4, ovoid, sessile, apical. Staminate spikes slender, 5.5 to 14 cm long, 1 to 1.5 mm in diameter; the peduncles densely villose, 1.3 to 2.8 cm long; rachis densely hirtellous; bracts sessile, peltate, disk glabrous above and on the margins, obovate, 0.75 to 1 mm long, 0.6 to 0.8 mm wide, apex truncate to rounded; stamens 3, rarely 2, pedicellate, about 0.5 mm long, anthers reniform, 2-valved, filaments somewhat exerted.

LUZON, Laguna Province, San Antonio, *Bur. Sci. 20594 Ramos;* Paete, *Bur. Sci. 22828 McGregor:* Tayabas Province, Lucban, *Elmer 7624* (type collection of *Piper villilimbum* C. DC.), *7927* (type collection of *Piper obovatibracteum* C. DC.), *7382;* Tagcauayan, *Bur. Sci. 13368 Ramos;* Mount Tulaog, *Bur. Sci. 29102 Ramos and Edaño;* Casiguran, *Bur. Sci. 45417, 45475 Ramos and Edaño:* Camarines Sur Province, Mount Isarog, *Bur. Sci. 22023 Ramos:* Sorsogon Province, without definite locality, *Haenke s. n.* (type of *Piper haenkeanum* Opiz in herb. Prague); Irosin, Mount Bulusan, *Elmer 14768, 15182, 15979;* without definite locality, *Bur. Sci. 23309 Ramos;* Mount Labao, *Bur. Sci. 23544 Ramos.* CATANDUANES, Bacon, *For. Bur. 29866 Denaga.* POLILLO, *Bur. Sci. 6853 Robinson.* MINDORO, Balete, *For. Bur. 6138 Merritt* (type of *Piper merrittii* C. DC. in herb. Manila); Baco River, *Merrill 1783;* Mount Halcon, *Bur. Sci. 40677 Ramos and Edaño;* Naujan, *Bur. Sci. 46435 Ramos.* SAMAR, Cauayan Valley, *Bur. Sci. 17557 Ramos.* LEYTE, Dagami, *Wenzel 308, 327, 414, 427;* Tacloban, *Wenzel 1660, 1734, 1791;* Jaro, Buenavista, *Wenzel 916, 730.* PANAY, Capiz Province, Jamindan, *Bur. Sci. 30850, 31260 Ramos and Edaño;* Libacao, *Bur. Sci. 31433 Ramos and Edaño;* Galecia, *Bur. Sci. 35304, 35508, 35512 Martelino and Edaño;* Mount Kinablangan, *Bur. Sci. 46004, 46009 Edaño.* BOHOL, Kalingohan, *Bur. Sci. 42798 Ramos;* Bilar, *Bur. Sci. 42751 Ramos.* MINDANAO, Surigao Province, Pla-

cer, *Wenzel 1879:* Agusan Province, Cabadbaran, Mount Urdaneta, *Elmer 13605;* Talacogon, Agusan River, *Merrill 7316:* Bukidnon Province, Tangkulan, *Bur. Sci. 39154 Ramos and Edaño.* SIARGAO, Dapa, *Bur. Sci. 34997 Ramos and Pascasio.* CAMIGUIN DE MINDANAO, Mambajao, *Elmer 14335;* Mount Volcan, *Bur. Sci. 14471, 14472 Ramos;* Mount Mahilog, *Bur. Sci. 14646 Ramos.* In forests at low and medium altitudes. Endemic.

Local names: Dumadingan (Lan.); litlít-kayakas (Mang.); manikatápai (Bag.); mandásai (Mbo.).

A species somewhat resembling *Piper caninum* Blume but easily distinguished by its leaves being copiously villose on both surfaces; its villose branches, petioles, and peduncles; its longer staminate spikes; and its obovate staminate bracts. *Piper merrittii* C. DC. and *Piper villilimbum* C. DC. are identical with this species. *Piper obovatibracteum* C. DC. is without question the male plant. I am certain of the identity of Opiz's species through an actual examination of the type courteously loaned by the Prague Herbarium.

63. PIPER CORDATILIMBUM sp. nov. Text fig. 75; Plate 12.

Frutex dioicus, scandens; ramulis petiolis et pedunculis dense pubescentibus; foliis chartaceis, stricte cordatis, 8 ad 14.5 cm longis, 5 ad 11 cm latis, basi aequilateralibus ad inaequilateralibus cordatis, 9-plinerviis, apice acute acuminatis, utrinque dense villosis; spicis ♀ 4 ad 7 cm longis; bracteis subsessilibus, peltatis, peltis transverse oblongis, 2 ad 2.25 mm longis, 1.5 ad 1.75 mm latis, supra marginibusque glabris; fructibus junioribus fusiformibus, vetustioribus ellipsoideis ad globosis, apice rostellatis, 4 ad 6 mm longis, 3 ad 4 mm diametro.

A dicœcious vine; the branches densely villose, terete, 2 to 5 mm in diameter. Leaves thinly chartaceous to chartaceous, upper and lower broadly heart-shaped, 8 to 14.5 cm long, 5 to 11 cm wide, base equilaterally to inequilaterally cordate, lobes rounded, sinuses up to 23 mm deep, 9-plinerved, rarely subplinerved, apex acutely acuminate, densely villose on both surfaces, margins densely villose; petioles densely villose, 1.5 to 3.5 cm long, in the lower leaves up to 5.5 cm in length. Pistillate spikes pendulous, 4 to 7 cm long, about 1.5 cm in diameter; the peduncles densely villose, 10 to 30 mm long; rachis densely villose, 2 to 3 mm in diameter; bracts subsessile, peltate, disk fleshy, glabrous above and on the margins, transversely oblong, 2 to 2.25 mm long, 1.5 to 1.75 mm wide; fruits pedicellate, not crowded, submature fusiform, mature ones ellipsoid to globose,

FIG. 75. *Piper cordatilimbum* sp. nov.; *1–4*, leaves, × 0.3; *5*, ovary, × 6.5; *6*, side view of pistillate bract, × 6.5; *7*, top view of pistillate bracts, × 6.5; *8–10*, fruits, × 5.

4 to 6 mm long, 3 to 4 mm in diameter, apex rostellate, acute, glabrous, the pedicels up to 3 mm long; stigmas usually 4, rarely 3 or 5, linear, acute, sessile, apical.

LUZON, Laguna Province, San Antonio, *Baker 2452, Bur. Sci. 16537 Ramos;* without definite locality, *Bur. Sci. 24933 Ramos:* Tayabas Province, Lucban, *Elmer 7627.* CATANDUANES, Mount Mareguidoy, *Bur. Sci. 30431 Ramos and Chan.* LEYTE, Jaro, Buenavista, *Wenzel 1095* (type collection of *Piper merrittii* C. DC. var. *parvifolium* C. DC.), *502, 1173;* Dagami, *Wenzel 309.* BOHOL, Bilar, *Bur. Sci. 42699 Ramos* (type in herb. Manila). MINDANAO, Davao Province, Todaya, Mount Apo, *Elmer 10581;* Mount Mayo, *Bur. Sci. 49482 Ramos and Edaño.* In forests at low and medium altitudes, ascending to 1,200 meters.

Two of the plants cited here were originally described by C. de Candolle as a form and variety of *Piper merrittii* C. DC. Further studies and an examination of more abundant material have convinced me that these plants do not belong to *Piper merrittii* C. DC. The proposed new species stands near to *Piper caninum* Blume var. *latibracteum* C. DC., from which it may be

readily distinguished by its strictly and broadly heart-shaped leaves, its transversely oblong bracts, and its rostellate fruits.

64. PIPER CABADBARANUM C. DC. Text fig. 76.

Piper cabadbaranum C. DC. in Leafl. Philip. Bot. 6 (1914) 2292, Candollea 1 (1923) 221; MERR., Enum. Philip. Fl. Pl. 2 (1923) 5.

A dicœcious vine; the branches glabrous, terete, 1 to 2 mm in diameter. Leaves firm, subcoriaceous, elliptic-ovate to elliptic-ovate-lanceolate, 6 to 9.3 cm long, 2 to 4.2 cm wide, base equilaterally to subequilaterally acute, 5-plinerved, apex acutely acuminate, glabrous on both surfaces, shining above, reticulations prominent on both surfaces; petioles glabrous, 8 to 20 mm long, in the lower leaves up to 30 mm long. Pistillate spikes usually retrose, 2.5 to 3.5 cm long, about 1.5 cm in diameter; the peduncles glabrous, 1.5 to 2 cm long; rachis hirsute; bracts sessile, peltate, disk orbicular-obovate to orbicular, 0.75 to 1 mm wide, ciliate above and on the margins, fleshy; fruits somewhat crowded, pedicellate, obovoid to globose, 4 to 4.5 mm long, 2.5 to 3 mm in diameter, glabrous, glandular, the pedicels sparingly glandular, up to 4 mm in length; stigmas 3 or 4, ovoid, obtuse, sessile, apical.

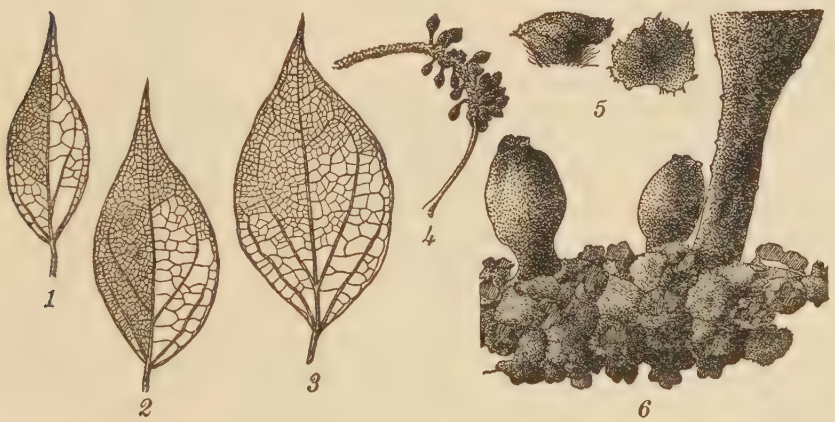

FIG. 76. *Piper cabadbaranum* C. DC.; *1–3*, leaves, × 0.5; *4*, pistillate spike, × 0.5; *5*, side and top views of pistillate bracts, × 10; *6*, portion of pistillate spike, × 7.5.

CATANDUANES, Santo Domingo, *Bur. Sci. 30536 Ramos and Chan.* MINDANAO, Agusan Province, Mount Urdaneta, *Elmer 14136* (type collection). Endemic.

A species allied to *Piper caninum* Blume, differing in its entirely glabrous branches, petioles, and peduncles, its glabrous,

subcoriaceous, elliptic-ovate to elliptic-ovate-lanceolate leaves, and its glandular fruits.

65. PIPER LONGIPEDICELLATUM sp. nov. Text fig. 77; Plate 13.

Frutex dioicus, scandens; ramulis 1.5 ad 2.5 mm diametro; foliis chartaceis, ovatis, 5 ad 8 cm longis, 3 ad 5 cm latis, basi aequilateralibus ad subaequilateralibus acutis, 5- ad 7-plinerviis, apice acute acuminatis, supra glabris, subtus hirtellis; spicis ♀ 4 ad 4.5 cm longis; bracteis sessilibus, peltatis, peltis subor-

FIG. 77. *Piper longipedicellatum* sp. nov.; *1*, fruiting branch with lower portion of pistillate spike, × 0.5; *2*, lower leaf, × 0.5; *3*, top and side views of pistillate bracts, × 10; *4*, portion of pistillate spike, × 7.5.

bicularis, ad 1.5 mm latis, supra glabris, margine ciliatis; fructibus longe pedicellatis, subglobosis, 4 ad 5 mm longis, 3.5 ad 4 mm diametro, basi parce hirtellis, pedicellis usque ad 9 mm longis.

A dicœcious vine; the branches terete, hirtellous, 1.5 to 2.5 mm in diameter. Leaves chartaceous, ovate, 5 to 8 cm long, 3 to 5 cm wide, the lower ones about 9 cm long, 7 cm wide, base equilaterally to subequilaterally acute, 5- to 7-plinerved, apex acutely acuminate, glabrous and shining above, sparsely hirtel-

lous to hirtellous beneath, reticulations more or less prominent on both surfaces; petioles hirtellous, 10 to 15 mm long, in the lower leaves up to 20 mm long. Pistillate spikes retrorse, 4 to 4.5 cm long, 1.8 to 2.3 cm in diameter; the peduncles hirtellous, 1.5 to 2 cm long; rachis hirsute; bracts sessile, peltate, disk glabrous above, ciliate on the margins, membranaceous, suborbicular, 1 to 1.5 mm wide; fruits long-pedicellate, spreading at maturity, subglobose, 4 to 5 mm long, 3.5 to 4 mm in diameter, sparsely hirtellous at their bases, the pedicels sparsely hirtellous, up to 9 mm long; stigmas 3 or 4, ovoid, acute, sessile, apical.

LUZON, Bontoc Subprovince, Mount Caua, *Bur. Sci. 38066 Ramos and Edaño* (type in herb. Manila), March 3,1920, on slopes in the mossy forest, altitude about 1,800 meters: Ifugao Subprovince, Mount Polis, *Bur. Sci. 19820 McGregor*, February 6, 1913.

This species is allied to *Piper cabadbaranum* C. DC., but may be readily distinguished by its long-pedicellate fruits, the pedicels pubescent at their bases. In vegetative character *Piper cabadbaranum* C. DC. is suggested, but the present species is distinguished by its pubescent leaves, petioles, branches, and peduncles.

66. PIPER ARBORISEDENS C. DC. Text fig. 78.

Piper arborisedens C. DC. in Philip. Journ. Sci. 11 (1916) Bot. 223, Candollea 1 (1923) 223; MERR., Enum. Philip. Fl. Pl. 2 (1923) 3.

A diœcious vine; the branches glabrous, terete, black, 1.5 to 3 mm in diameter. Leaves chartaceous, lanceolate, 8 to 11 cm long, 2 to 3.5 cm wide, base equilaterally to subequilaterally acute, 5-plinerved, narrowed to the slenderly acuminate apex, entirely glabrous on both surfaces, reticulations somewhat obscure to obsolete beneath; petioles glabrous, 10 to 18 mm long, in the lower leaves up to 30 cm long. Pistillate spikes subpendulous, 3 to 4 cm long, 1.5 to 2 cm in diameter; the peduncles glabrous, about 1.5 cm long; rachis hirsute; bracts sessile, peltate, disk fleshy, glabrous above and on the margins, suborbicular to orbicular, 1 to 1.25 mm wide, margin somewhat undulate; fruits pedicellate, somewhat crowded, fusiform, umbonate, 5 to 6.5 cm long, 3 to 4 mm in diameter, glabrous, black when dry, the pedicels glabrous, up to 3 mm in length; stigmas 3, ovoid, acute, sessile, apical.

LUZON, Laguna Province, San Antonio, *Bur. Sci. 24934 Ramos* (type collection), August 20, 1910, in forests. Endemic.

A species belonging in the group with *Piper caninum* Blume by its pedicellate fruits and resembling *Piper spathelliferum*

FIG. 78. *Piper arborisedens* C. DC.; *1*, leaves, × 0.5; *2*, pistillate spike, × 0.5; *3*, portion of pistillate spike, × 7.5; *4*, fruit, × 7.5.

sp. nov. in leaf form and texture, but differing from the latter in many respects, in its plinerved lamina, fusiform, pedicellate fruits and sessile, peltate bracts. It is distinguished from *Piper caninum* Blume by the form, texture, and color of its leaves and by its glabrous bracts.

67. PIPER ACUTIBACCUM C. DC. Text fig. 79.

Piper acutibaccum C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 459, Candollea 1 (1923) 225; MERR., Enum. Philip. Fl. Pl. 2 (1923) 2.

A dioecious vine; the branches pilose, terete, 1.25 to 2.5 mm in diameter. Leaves chartaceous, elliptic-lanceolate, 10.5 to 14.5 cm long, 3 to 4.5 cm wide, base equilateral, cuneate, 5-plinerved, narrowed to the slenderly acuminate apex, entirely glabrous above, sparsely pilose beneath, olivaceous above when dry, paler beneath, reticulations more or less obscure beneath; petioles pilose, 10 to 12 mm long, in the lower leaves up to 20 mm in length. Pistillate spikes suberect, 4 to 7 cm long, 1.5 to 1.8 cm in diameter; the peduncles sparsely pilose, 10 to 15 mm long; rachis hirsute; bracts subsessile, peltate, disk glabrous above and on the margins, suborbicular to orbicular, 1 to 1.5 mm wide; fruits pedicellate, more or less crowded, fusiform, 7 to 8.5 cm long, 2.75 to 3.5 mm in diameter, glabrous, black when dry, the pedicels glabrous, up to 3 mm in length; stigmas 3, linear, sessile, apical.

FIG. 79. *Piper acutibaccum* C. DC.; *1*, typical leaf and lower portion of pistillate spike, × 0.5; *2*, portion of pistillate spike, × 7.5; *3*, top and side views of pistillate bracts, × 10.

LUZON, Laguna Province, San Antonio, *Bur. Sci. 10031 Ramos* (type in herb. Manila), in forests at low altitudes. Endemic.

This species, belonging in the group with *Piper caninum* Blume, stands very near *Piper arborisedens* C. DC., but differs from the latter conspicuously in its pubescent leaves, branches, petioles, and peduncles and in its subsessile bracts.

68. PIPER PAUCINERVE C. DC. Text fig. 80; Plate 14.

Piper paucinerve C. DC. in Perk. Frag. Fl. Philip. (1905) 156, Philip. Journ. Sci. 5 (1910) Bot. 456, Candollea 1 (1923) 222, 227; MERR., Enum. Philip. Fl. Pl. 2 (1923) 13.

A diœcious vine; the branches glabrous, terete, 1 to 1.5 mm in diameter. Leaves subchartaceous, elliptic-lanceolate, 8.5 to 10.5 cm long, 2.2 to 3.5 cm wide, base equilaterally acute, 5-plinerved, apex acutely acuminate, entirely glabrous on both surfaces, reticulations somewhat prominent on both surfaces; petioles gla-

brous, 7 to 15 mm long. Pistillate spikes subpendulous, 2 to 3.3 cm long, about 1.5 cm in diameter; the peduncles glabrous, 12 to 13 mm long; rachis densely hirtellous; bracts sessile, peltate, disk glabrous above and on the margins, membranaceous, transversely elliptic, about 1 mm wide; ovaries minutely puberulent; fruits pedicellate, not crowded, ellipsoid, about 4 mm long, 3 mm in diameter, glabrous, the pedicels glabrous, up to 2 mm long; stigmas 3, ovoid, acute, sessile, apical.

LUZON, Isabela Province, Malunu, *Warburg 11929* (type in herb. Berlin). Endemic.

A species in some respects resembling *Piper arborisedens* C. DC., but differing in its transversely elliptic bracts, its minutely puberulent ovaries, and its ellipsoid fruits.

FIG. 80. *Piper paucinerve* C. DC.; *1*, typical leaf, × 0.5; *2*, portion of the pistillate spike, × 0.5; *3*, top view of pistillate bracts, × 7.5; *4*, fruits, × 7.5.

69. PIPER BREVISTIGMUM C. DC. Text fig. 81.

Piper brevistigmum C. DC. in Leafl. Philip. Bot. 6 (1914) 2292, Candollea 1 (1923) 203; MERR., Enum. Philip. Fl. Pl. 2 (1923) 5.

A dicœcious vine; the branches glabrous, terete, smooth, 1.5 to 3 mm in diameter. Leaves chartaceous, brown, ovate to broadly ovate, 7 to 12 cm long, 4.5 to 10 cm wide, base usually oblique, subequilaterally obtuse to subrounded, 5-plinerved, apex acutely acuminate, glabrous above, more or less pilose on the nerves and sparingly so on the parenchyma beneath, reticulations more or less prominent beneath; petioles glabrous, 10 to 15 mm long, in the lower leaves up to 30 mm in length. Pistillate spikes pendulous, interrupted, 5.5 to 7.5 cm long, 9 to 10 mm in diameter; the peduncles glabrous, 1 to 1.8 cm long; rachis hirsute; bracts free, sessile, peltate, disk glabrous above, ciliate on

the margins, subrounded to rounded-subobovate, 1.25 to 1.5 mm wide; fruits free, sessile, oblong-obovoid, 4 to 4.5 mm long, 2.5 to 3 mm in diameter, glabrous; stigmas 3, ovoid, acute, sessile, apical.

MINDANAO, Agusan Province, Cabadbaran, Mount Urdaneta, *Elmer 13684* (type collection), in forests, altitude about 1,000 meters. Endemic.

Local name: Ianahon (Mbo.).

FIG. 81. *Piper brevistigmum* C. DC.; *1–3*, leaves, × 0.5; *4*, top view of pistillate bracts, × 10; *5*, fruits, × 7.5.

According to C. de Candolle the species is close to the Javanese *Piper cilibracteum* C. DC., which I have not seen. It is probably intermediate between *Piper caninum* Blume and *Piper interruptum* Opiz. It is related to *Piper caninum* Blume by its sessile, peltate bracts, but differs in its sessile fruits. In the latter character it appears near to *Piper interruptum* Opiz. It has ovate to broadly ovate leaves and ciliate bracts.

70. PIPER SORSOGONUM C. DC. Text fig. 82.

Piper sorsogonum C. DC. in Candollea 1 (1923) 223, *nomen nudum*, 2 (1923) 188.

Dioicus, scandens; foliis chartaceis, ovatis ad rotundato-ovatis, 10 ad 17 cm longis, 6.5 ad 10.5 cm latis, foliis ad basi usque ad

FIG. 82. *Piper sorsogonum* C. DC.; *1–2*, leaves, × 0.5; *3*, pistillate spike, × 0.5; *4*, hairs on the bracts, much enlarged; *5*, fruit and portion of the rachis, × 7.5; *6*, top and side views of pistillate bracts, × 7.5.

20.5 cm longis, 19.5 cm latis, base aequilateralibus ad subaequilateralibus rotundatis vel cordatis, 7-plinerviis, apice acute acuminatis, utrinque glabris; petiolo glabro, 2 ad 4.5 cm longo; spicis ♀ 9.5 ad 19.5 cm longis; pedunculis glabris; rachis puberulis; bracteis adnatis cum rachis, apice marginibusque liberis, ciliatis, oblongis, 1.5 ad 2 mm longis, 0.5 ad 1 mm latis; fructibus pedicellatis, glabris, ellipsoideis ad subglobosis, 4 ad 6.5 mm longis, 3 ad 5 mm diametro, pedicellis usque ad 5 mm longis, glabris; stigmatibus 3 vel 5, ovoideis, acutis, sessilibus.

A dicœcious vine; the branches glabrous, terete, 2 to 5 mm in diameter. Leaves chartaceous, ovate to rounded-ovate, 10 to 17 cm long, 6.5 to 10.5 cm wide, the lower ones up to 20.5 cm long, 19.5 cm wide, base equilaterally to subequilaterally rounded or cordate, 7-plinerved, apex acutely acuminate, glabrous on both surfaces, reticulations more or less prominent beneath; petioles glabrous, rugose, 2 to 4.5 cm long, in the lower ones up to 6.5 cm in length. Pistillate spikes long, pendulous, 9.5 to 19.5 cm long, 1.5 to 2 cm in diameter; the peduncles glabrous, 1.8 to 2.5 cm long; rachis puberulent; bracts adnate to the rachis, apex and margin free, oblong, with the apex wider than the base, 1.5 to 2 mm long, 0.5 to 1 mm wide, ciliate above and on the margins; fruits pedicellate, glabrous, ellipsoid to subglobose, 4 to 6.5 mm long, 3 to 5 mm in diameter, black when dry, pedicels up to 5 mm in length, glabrous; stigmas 3 or 5, ovoid, acute, sessile, apical.

LUZON, Camarines Norte Province, Mount Bacacay, *Bur. Sci. 33835 Ramos and Edaño:* Sorsogon Province, Irosin, Mount Bulusan, *Elmer 14921* (type collection). LEYTE, Mount Abucayan, *Bur. Sci. 41833 Edaño.* In forests at low and medium altitudes. Endemic.

This species is allied to *Piper elmeri* Merr. by its pedicellate fruits and the nature of its bracts, but differs in its smaller and glabrous leaves and its relatively smaller fruits and bracts.

71. PIPER ELMERI Merr. Text figs. 83 and 84.

Piper elmeri MERR. in Philip. Journ. Sci. 17 (1920) 245, Enum. Philip. Fl. Pl. 2 (1923) 8.

A coarse, woody, dicœcious vine; the branches glabrous, terete, the older ones rugose, brownish when dry, about 1 cm in diameter. Leaves chartaceous to subcoriaceous, broadly ovate, 15 to 28 cm long, 11 to 23 cm wide, base equilateral to subequilateral, deeply cordate, the lobes broadly rounded, the sinuses up to 4 cm deep, 10- to 12-plinerved, apex shortly and acutely acu-

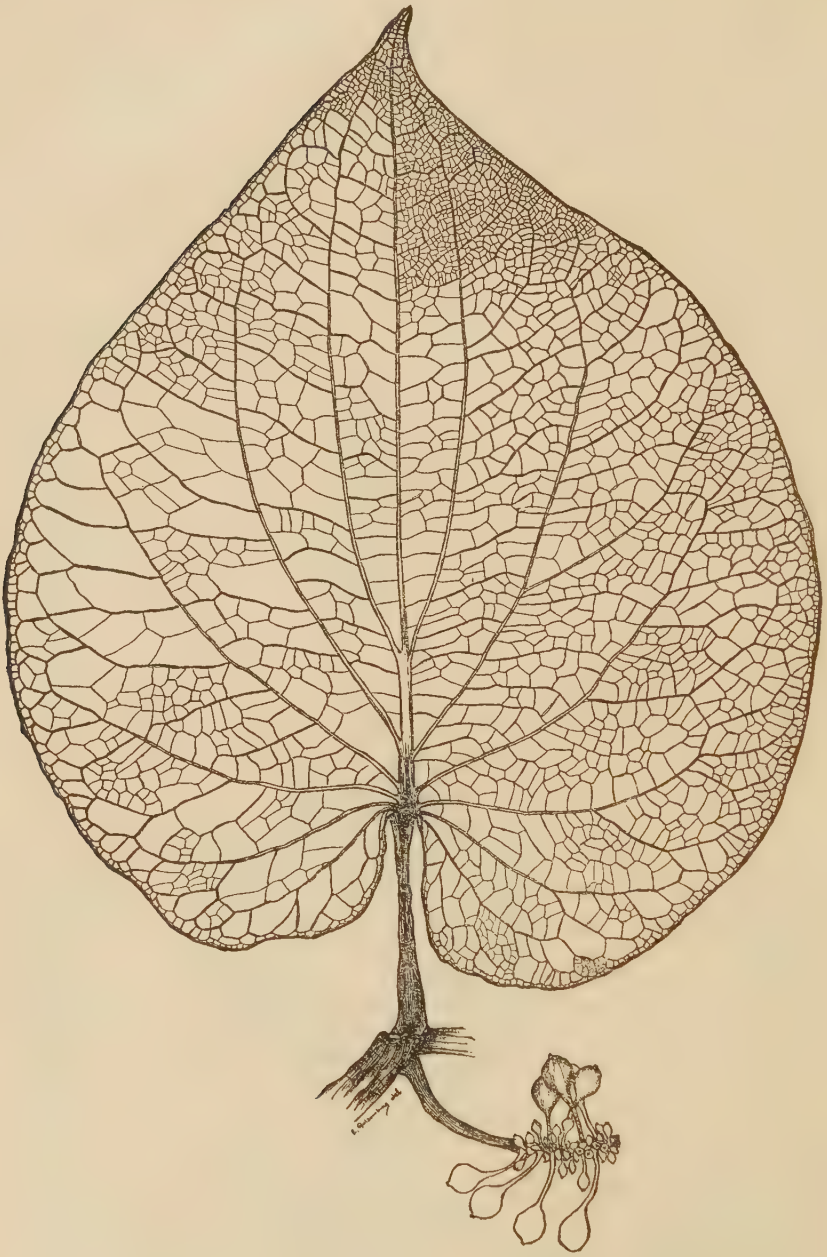

FIG. 83. *Piper elmeri* Merr.: typical leaf of the female plant with portion of the pistillate spike, × 0.5.

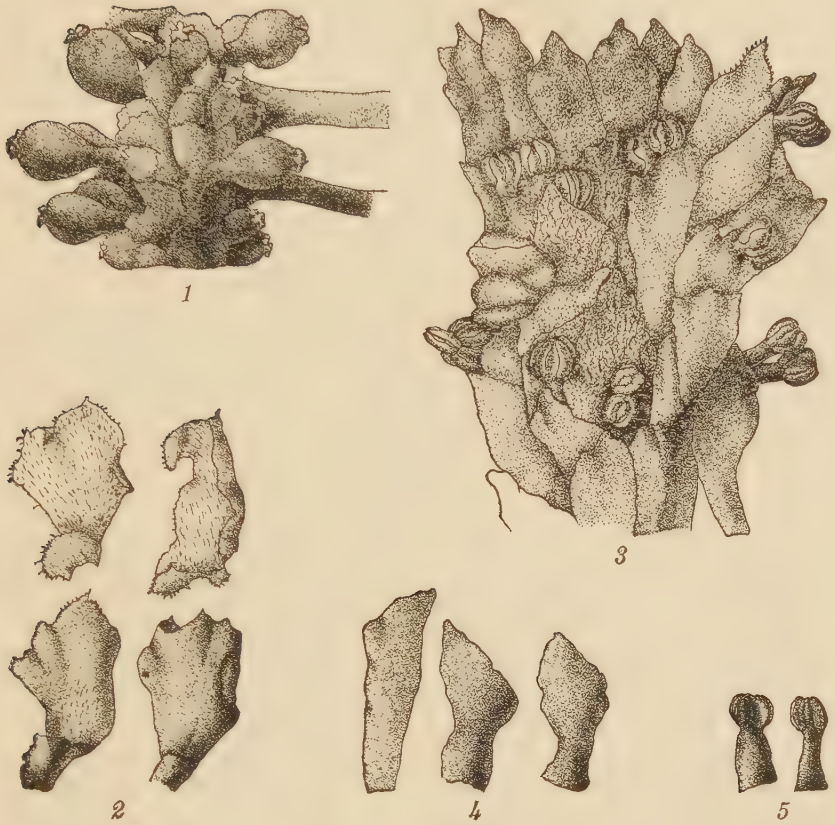

FIG. 84. *Piper elmeri* Merr.; *1*, portion of pistillate spike, × 7.5; *2*, top and side views of pistillate bracts, × 7.5; *3*, portion of staminate spike, × 7.5; *4*, top view of staminate bracts, × 7.5; *5*, stamens, × 7.5.

minate, quite glabrous, shining and olivaceous above, densely and softly pubescent beneath, reticulations prominent on both surfaces; petioles sparsely to densely hirsute, rugose, 4 to 6.5 cm long. Pistillate spikes long, pendulous, 20 to 23 cm long, 3.5 to 5 cm in diameter; the peduncles glabrous, rugose, 2.5 to 3.5 cm long; rachis densely pilose, rather stout, about 5 mm in diameter; bracts adnate to the rachis, apex and margins free, oblong-obovate, acute, 3 to 4 mm long, 1.5 to 2.5 mm wide at the apex, ciliate above and on the margins, fleshy; fruits large, spreading, pedicellate, ovoid-globose, 7 to 9 mm long, 6.5 to 8 mm in diameter, apex umbonate, yellowish red when fresh, somewhat wrinkled and usually black when dry, glabrous, pedicels hirtellous at their bases, up to 1.5 cm long; stigmas 3 or 5, ses-

sile, apical. Staminate spikes long, pendulous, 17 to 25 cm long, 4 to 6 mm in diameter; the peduncles hirtellous, 1.5 to 2 cm long; rachis densely pilose; bracts adnate to the rachis, apex and margins free, oblanceolate to oblong-ovate, subacute, 3 to 4 mm long, up to 1.5 mm wide at the apex, up to 1 mm wide at the base, ciliate above and on the margins, membranaceous; stamens 2, pedicellate, 1.75 to 2 mm long, anthers oblong, 2-valved, 0.5 to 0.75 mm wide, filaments cylindric, somewhat swollen at the base, longer than the anthers.

LUZON, Laguna Province, Mount Maquiling, *For. Bur. 26751 Mabesa, Elmer 18059:* Sorsogon Province, Mount Pocdol, *Bur. Sci. 23490 Ramos.* SAMAR, Catubig River, *Bur. Sci. 24256 Ramos* (type in herb. Manila). In damp forests at low and medium altitudes, ascending to 450 meters on Mount Maquiling. Endemic.

Local name: Buyog-halas (Bik.).

A remarkable species, easily recognized by its broadly ovate, deeply cordate leaves, which are softly pubescent beneath; its rather stout, elongated spikes and their pubescent bracts; and its large, long-pedicellate fruits. This species and *Piper sorsogonum* C. DC. stand in a group by themselves. They are somewhat allied to *Piper caninum* Blume by their pedicellate fruits and to *Piper interruptum* Opiz by their bracts, which are adnate to the rachis. In some of its vegetative features, the species bears resemblance to *Piper mollissimum* Blume. No critical comparison of the reproductive features is made as the isotype specimen of Blume's species in the Gray Herbarium is sterile.

72. **PIPER INTERRUPTUM** Opiz. Text figs. 85, 1–3; 86; Plate 17, fig. 1.

Piper interruptum OPIZ in Presl Rel. Haenk. 1 (1828) 157; MIQ., Syst. Pip. (1843) 336; C. DC., Prodr. 16[1] (1869) 377, Philip. Journ. Sci. 5 (1910) Bot. 448 (incl. forma *b* C. DC.), 11 (1916) Bot. 222 (incl. forma *c* C. DC.), Candollea 1 (1923) 216–217; F.-VILL., Novis. App. (1880) 176; MERR., Enum. Philip. Fl. Pl. 2 (1923) 9.

A dioecious vine; the branches glabrous, terete, 2 to 4.5 mm in diameter. Leaves submembranaceous to chartaceous, oblong-elliptic to ovate, 6 to 13 cm long, 3.5 to 7 cm wide, base equilaterally to subequilaterally subacute to rounded, 5-nerved, rarely 7-nerved, apex acutely acuminate, glabrous on both surfaces, reticulations prominent beneath; petioles glabrous, 1 to 2.5 cm long, in the lower leaves up to 4 cm in length. Pistillate spikes pendulous, elongated, interrupted, 5 to 17.5 cm long, 0.8 to 1.5 cm in diameter; the peduncles glabrous, 1 to 4 cm long; rachis pilose; bracts long, adnate to the rachis, margins and apex free,

FIG. 85. Leaves of: *1–3*, *Piper interruptum* Opiz; *4–6*, var. *loheri* (C. DC.) comb. nov.; *7–11*, var. *cumingianum* (Miq.) comb. nov.; *12*, var. *laevirameum* C. DC.; *13–14*, var. *multiplinerve* C. DC. All × 0.3.

apex obtuse to repand, 2.5 to 3 mm long, 1.2 to 1.5 mm wide, glabrous; fruits free, sessile, ovoid, oblong-ovoid, or globose-ovoid, 3 to 6 mm long, 2 to 4 mm in diameter, glabrous, smooth to slightly glandular; stigmas 3 or 4, ovoid, acute, sessile, apical. Staminate spikes greatly elongated, pendulous, cylindric, 11 to 27 cm long, 1.5 to 3 mm in diameter; the peduncles glabrous, 1 to 4.5 cm long; rachis slightly pilose; bracts long, adnate to the rachis, margins and apex free, never fully imbricate, 3 to 4 mm long, 0.5 to 1 mm wide, apex obtuse to subrounded; stamens 2 or 3, two lateral and one posterior, the latter usually smaller, 0.6 to 11 mm long, anthers oblong to reniform, 2-valved, filaments oblong, as long as the anthers or slightly longer.

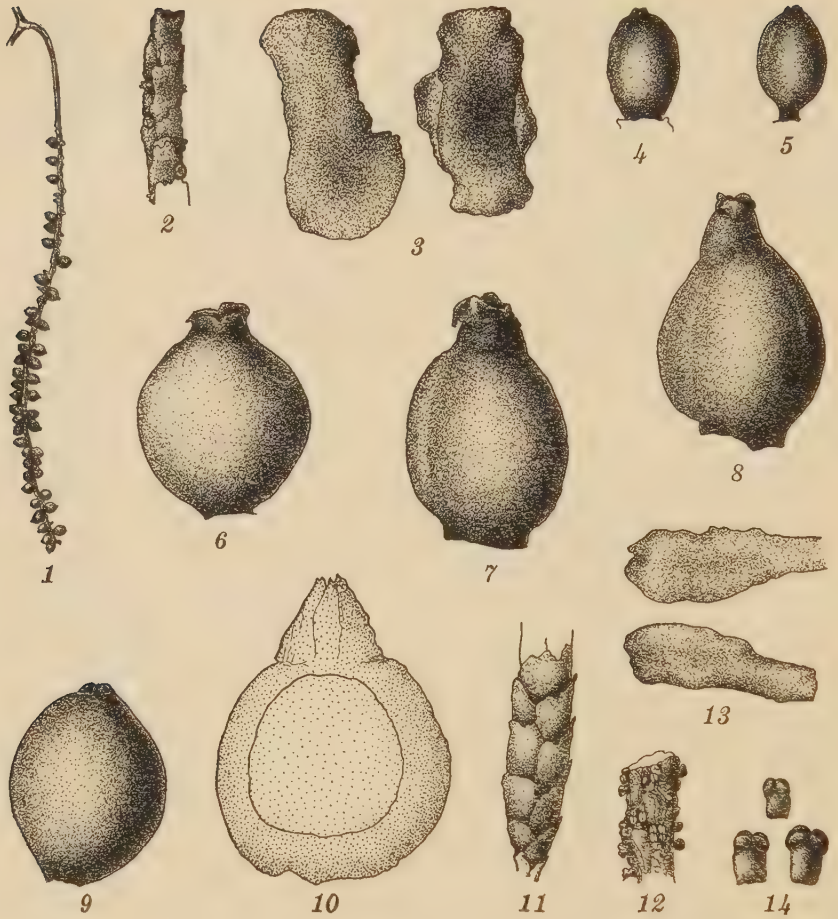

FIG. 86. *Piper interruptum* Opiz; *1*, pistillate spike, × 0.5; *2*, bracts and ovaries on young pistillate spike, × 1.5; *3*, top view of pistillate bracts, × 7.5; *4–5*, fruits, × 2.5; *6–9*, fruits, × 7.5; *10*, longitudinal section of a fruit, × 10; *11*, bracts on the staminate spike, × 3; *12*, portion of staminate spike, enlarged; *13*, top view of staminate bracts, × 7.5; *14*, stamens, × 7.5.

LUZON, without definite province or locality, *Haenke s. n.* 1792 (type of *Piper interruptum* Opiz in herb. Prague): Cagayan Province, Abulug to Linao, *For. Bur. 11611 Curran:* Bontoc Subprovince, Mount Malaya, *Bona 426:* Nueva Viscaya Province, Campote, *Bur. Sci. 20144 McGregor:* Nueva Ecija Province, Bongalon, *For. Bur. 8495 Curran:* Bulacan Province, Angat, *Philip. Pl. 1435 Ramos:* Bataan Province, Lamao, Mount Mariveles, *Williams 16:* Rizal Province, Montalban, *Philip. Pl. 269 Merrill;*

Pasig, *Bur. Sci. 11840 Robinson:* Laguna Province, Los Baños, *Hallier s. n.* 1903, *Baker 1764;* Calauan, *Bur. Sci. 12421, 12425 McGregor;* Lilio, *Bur. Sci. 6015 Robinson:* Tayabas Province, *Bur. Sci. 45340 Ramos and Edaño:* Batangas Province, *Milaor 278.* In forests at low and medium altitudes. The species, including the varieties, is widely distributed in the Philippines, and occurs also in New Guinea.

Local names: Ikmong-uák (Tag.); litlít (Tag.); paminta (Tag.).

A species strongly characterized by its elongated, interrupted pistillate spikes, its long bracts which are adnate to the rachis, and its exerted stamens.

Var. LOHERI (C. DC.) comb. nov. Text fig. 85, 4-6.

Piper loheri C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 450, 11 (1916) Bot. 223, Candollea 1 (1923) 216; MERR., Enum. Philip. Fl. Pl. 2 (1923) 11.

Piper abraense C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 451, Candollea 1 (1923) 217; MERR., Enum. Philip. Fl. Pl. 2 (1923) 2.

Leaves elliptic-ovate to rounded-ovate, 6 to 10.5 cm long, 2.8 to 7.5 cm wide, base equilaterally to subequilaterally acute to rounded, 5-nerved, apex acutely acuminate.

LUZON, without definite province and locality (northern Luzon), *Warburg 12123:* Abra Province, Baret, *Bur. Sci. 7195 Ramos* (type of *Piper abraense* C. DC. in herb. Manila): La Union Province, Bauang, *Bur. Sci. 12983 Fénix* (type collection of *Piper loheri* C. DC. forma *c* C. DC.), *Elmer 5738;* San Fernando, *Lete 66:* Pangasinan Province, Libtong, Villasis, *Alberto 45:* Pampanga Province, Arayat, *Villegas 20:* Bulacan Province, Malolos, *Templeton s. n.;* Norzagaray, *Bur. Sci. 12242 Foxworthy:* Rizal Province, San Mateo, *Loher 4553* (type collection of *Piper loheri* C. DC.), *4554, 4555;* Montalban, *Merrill 5039:* Manila, Singalong, *Bur. Sci. 12217 Ramos:* Laguna Province, Los Baños, Mount Maquiling, *Savella and Gates 5812, Osorio and Gates 6163, Elmer 18229:* Tayabas Province, Casiguran, *Bur. Sci. 45214 Ramos and Edaño.* In thickets and forests at low altitudes, ascending to 400 meters. Endemic.

Local names: Kadákad (Ilk.); kaláat (Ilk.); kalaskás (Tag.); litlít-kauáyan (Tag.); pamipamintahan (Tag.); sámat-anák (Pamp.).

This variety differs from the species in its elliptic-ovate to rounded-ovate leaves.

Var. CUMINGIANUM (Miq.) comb. nov. Text fig. 86, 7–11.

Piper cumingianum MIQ., Syst. Pip. (1843) 329, Fl. Ind. Bat. 1[2] (1858–59) 454; C. DC., Prodr. 16[1] (1869) 366; F.-VILL., Novis. App. (1880) 176; VIDAL, Phan. Cuming. Philip. (1885) 138, Rev. Pl. Vasc. Filip. (1886) 219.

Piper samaranum C. DC. in Philip. Journ. Sci. 11 (1916) Bot. 223, Candollea 1 (1923) 217; MERR., Enum. Philip. Fl. Pl. 2 (1923) 15.

Lamina narrowly elliptic-oblong to elliptic-lanceolate, 6 to 11.5 cm long, 2 to 4 cm wide, both apex and base acute, 5-nerved, sometimes 5-subplinerved.

LUZON, Ilocos Norte Province, Bangui to Claveria, *Bur. Sci. 33008 Ramos;* Mount Nagapatan, *Bur. Sci. 33180 Ramos:* Bontoc Subprovince, Bognen, *Vanoverbergh 558;* Gintadan, *Vanoverbergh 1184* (type collection of *Piper interruptum* Opiz forma *c* C. DC.); Bauco, *Vanoverbergh 1166;* Mount Polis, *Bur. Sci. 37665 Ramos and Edaño;* Mount Caua, *Bur. Sci. 37987 Ramos and Edaño:* Zambales Province, Candelaria, *Bur. Sci. 4813 Ramos:* Rizal Province, without definite locality, *Loher 13192;* Antipolo, *Bur. Sci. 22278 Ramos;* Mount Lumutan, *Bur. Sci. 29659, 29791 Ramos and Edaño;* Mount Angilog, *Bur. Sci. 40768 Ramos;* Mount Irig, *Bur. Sci. 42286 Ramos;* Mount Tokduanbanoy, *Bur. Sci. 48596, 48608 Ramos and Edaño:* Albay Province, without definite locality, *Cuming 1190* (type of *Piper cumingianum* Miq. in herb. Kew; isotype in herb. Manila). MINDORO, Paluan, *Bur. Sci. 39763 Ramos.* SAMAR, Cauayan Valley, *Bur. Sci. 17546 Ramos* (type collection of *Piper samaranum* C. DC.). LEYTE, Jaro, Masaganap, *Wenzel 613.* MINDANAO, Agusan Province, Cabadbaran, Mount Urdaneta, *Elmer 13582, 13837:* Davao Province, Mati, *Bur. Sci. 49084, 49133 Ramos and Edaño:* Zamboanga Province, Sax River mountains, *Merrill 8264.* In forests at low and medium altitudes, ascending to 1,000 meters. Endemic.

C. de Candolle reduced *Piper cumingianum* Miq. to a synonym of *Piper interruptum* Opiz, but I prefer to consider it as having varietal status. It differs from the species in the form of the lamina.

Var. LAEVIRAMEUM (C. DC.) comb. nov. Text fig. 85, 12.

Piper laevirameum C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 450, Candollea 1 (1923) 215; MERR., Enum. Philip. Fl. Pl. 2 (1923) 10.

Lamina broadly oblong, 15 to 16.5 cm long, 7.5 to 8.5 cm wide, 7-nerved; petioles about 2 cm long.

MINDANAO, Lanao Province, Camp Keithley, Lake Lanao, *Clemens 1255* (type of *Piper laevirameum* C. DC. in herb. Manila).

This variety differs from the species by its larger and typical broadly oblong leaves.

Var. MULTIPLINERVE C. DC. Text fig. 85, 13-14.

Piper interruptum Opiz var. *multiplinervum* C. DC. in Leafl. Philip. Bot. 3 (1910) 785, Philip. Journ. Sci. 5 (1910) Bot. 448, Candollea 1 (1923) 217; MERR., Enum. Philip. Fl. Pl. 2 (1923) 9.

Piper interruptum Opiz var. *herbaceum* C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 448, Candollea 1 (1923) 216; MERR., Enum. Philip. Fl. Pl. 2 (1923) 9.

Piper interruptum Opiz var. *subarborescens* C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 448, Candollea 1 (1923) 217; MERR., Enum. Philip. Fl. Pl. 2 (1923) 10.

Piper subarborescens C. DC. in Philip. Journ. Sci. 11 (1916) Bot. 222.

Piper loheri C. DC. forma *multiplinerve* C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 450, 11 (1916) Bot. 223, Candollea 1 (1923) 216; MERR., Enum. Philip. Fl. Pl. 2 (1923) 11.

Piper pilispicum C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 452, Candollea 1 (1923) 269; MERR., Enum. Philip. Fl. Pl. 2 (1923) 13.

Lamina broadly oblong to oblong-elliptic, 9.5 to 17.5 cm long, 3.5 to 8.5 cm wide, base 5-plinerved.

LUZON, Ilocos Norte Province, Mount Piao, *For. Bur. 12484 Merritt and Darling:* Benguet Subprovince, without definite locality, *Bur. Sci. 5720 Ramos* (type of *Piper pilispicum* C. DC. in herb. Manila); without definite locality, *For. Bur. 15865 Bacani:* Pangasinan Province, Mount San Isidro, Labrador, *Bur. Sci. 30015 Fénix:* Zambales Province, Mount Cabangaan, Butulan, *Bur. Sci. 26850 Edaño:* Bataan Province, Lamao, *Bur. Sci. 1870 Foxworthy* (type of *Piper interruptum* Opiz var. *multiplinerve* C. DC. in herb. Manila); Lamao River, Mount Mariveles, *Merrill 3182* (type of *Piper interruptum* Opiz var. *herbaceum* C. DC. in herb. Manila), *Elmer 6855, Whitford 1040:* Rizal Province, Bosoboso, *Bur. Sci. 4585* (type of *Piper interruptum* Opiz var. *subarborescens* C. DC. in herb. Manila), *1019 Ramos, For. Bur. 3299 Ahern's collector;* San Isidro, *Philip. Pl. 267 Ramos;* Montalban, *Loher 12375;* Mount Masungi, *Bur. Sci. 13615 Ramos;* Mount Susong-dalaga, *Bur. Sci. 29290 Ramos and Edaño;* Mount Lumutan, *Bur. Sci. 29670 Ramos and Edaño;* Mount Irid, *Bur. Sci. 41913 Ramos, Bur. Sci. 48523 Ramos and Edaño;* San Andales, *Bur. Sci. 48708, 48740, 48798, 48801 Edaño:* Laguna Province, Los Baños, *Baker 212, 1010, Gates and Harder 5872;* Mount San Cristobal, *Juliano 1086:* Sorsogon Province, Mount Bagacaua, *Bur. Sci. 23525 Ramos.* MINDORO, Paluan, *Bur. Sci. 39734 Ramos;* Mount Halcon, *Bur. Sci. 40608 Ramos and Edaño.* PANAY, Antique Province, Culasi, *Bur. Sci. 32310, 32321 McGregor.* MINDANAO, Surigao Province, Surigao, *Bur.*

Sci. 34428 Ramos and Pascasio: Agusan Province, Liluan Lake, *Weber 1204;* Cabadbaran, Urdaneta, *Elmer 14177:* Bukidnon Province, Mount Candoon, *Bur. Sci. 38831, 38833 Ramos and Edaño;* Tangkulan, *Bur. Sci. 39114 Ramos and Edaño.* In thickets and forests, at low and medium altitudes, ascending to 1,100 meters. Endemic.

Local names: Kaláscas (Tag.); litlít (Tag.); litlít-áso (Tag.).

After a critical comparison of the above reduced varieties and species I can suggest no other disposition of them. The striking feature of this variety is its plinerved lamina. The mature fruits are ovoid to globose, though in some cases they are ellipsoid. Four stigmas were not only found in var. *multiplinerve* but also in varieties *herbaceum* and *subarborescens* as well as in *Piper loheri* forma *multiplinerve* C. DC. Stamens in the varieties reduced vary from 2 to 3. *Piper acre* Blume is probably allied to this species.

73. PIPER DAVAOENSE C. DC. Text fig. 87.

Piper davaoense C. DC. in Perk. Frag. Fl. Philip. (1905) 154, Leafl. Philip. Bot. 3 (1910) 785, Philip. Journ. Sci. 5 (1910) Bot. 453, Candollea 1 (1923) 218; MERR., Enum. Philip. Fl. Pl. 2 (1923) 7.

Piper laxirameum C. DC. in Leafl. Philip. Bot. 3 (1910) 779, Philip. Journ. Sci. 5 (1910) Bot. 443, Candollea 1 (1923) 219; MERR., Enum. Philip. Fl. Pl. 2 (1923) 10.

A dicœcious vine; the branches glabrous, smooth, terete, 1 to 2 mm in diameter. Leaves chartaceous, oblong to oblong-ovate, 5 to 9.5 cm long, 2 to 5.3 cm wide, base equilaterally to subequilaterally obtuse to rounded, 5-plinerved, sometimes 7-plinerved, apex acutely acuminate, glabrous on both surfaces, reticulations prominent beneath; petioles glabrous, 5 to 10 mm long, in the lower leaves up to 20 mm in length. Pistillate spikes long, pendulous, interrupted, 9.5 to 30 cm long, about 0.8 cm in diameter; peduncles glabrous, 1.5 to 2 cm long; rachis pilose; bracts long, adnate to the rachis, margins and apex free, oblong, subrounded, 3.75 to 4.25 mm long, 1 to 1.25 mm wide at the apex, glabrous above; fruits free, sessile, oblong to ovoid, 3.5 to 4 mm long, 2.25 to 2.5 mm in diameter, glabrous, black when dry; stigmas 3 or 4, ovoid, acute, sessile, apical. Staminate spikes greatly elongated, pendulous, 10 to 16.5 cm long, 3 to 3.5 mm in diameter; the peduncles glabrous, 3 to 4 cm long; rachis hirsute; bracts long, fully imbricate, membranaceous, adnate to the rachis, margins free, elliptic-obovate, 3 to 3.5 mm long, about 2 mm wide at the apex; stamens 3, sessile, never

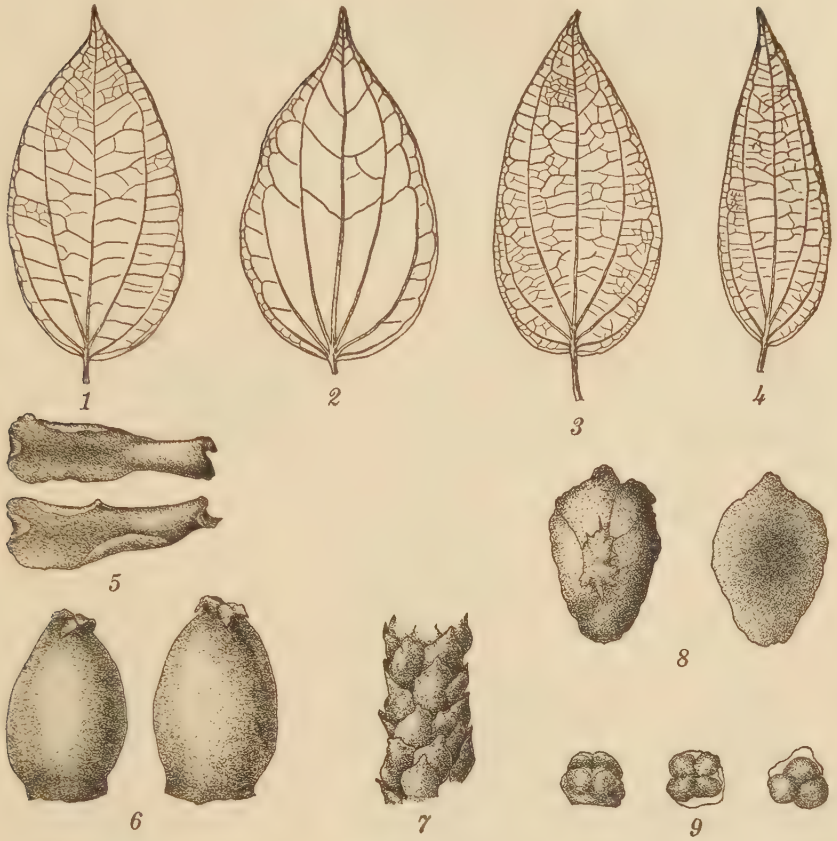

FIG. 87. *Piper davaoense* C. DC.; *1–4*, leaves, × 0.5; *5*, top view of pistillate bracts, × 7.5; *6*, fruits, × 7.5; *7*, portion of mature staminate spike, × 4.5; *8*, lower and upper views of staminate bracts, × 7.5; *9*, stamens, × 10.

exerted, two lateral and one posterior, anthers oblong, in the lateral stamens 4-valved, in the posterior one 3-valved.

MINDANAO, Davao Province, Mount Dagatpan, *Warburg 14740* (type of *Piper davaoense* C. DC. in herb. Berlin); Malita, *Copeland 676;* Todaya, Mount Apo, *Elmer 11065, 10503* (type collection of *Piper laxirameum* C. DC.). In forests, altitude from 600 to 1,300 meters. Endemic.

Local name: Manikatápai (Bag.).

The female plant is undoubtedly very close to *Piper interruptum* Opiz. The male plant with three stamens which are never exerted, differs from *Piper interruptum* Opiz by its fully imbricate, membranaceous, elliptic-obovate bracts.

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74. PIPER PULOGENSE C. DC. Text fig. 88.

Piper pulogense C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 453, 11 (1916) Bot. 222, Candollea 1 (1923) 221; MERR., Enum. Philip. Fl. Pl. 2 (1923) 14.

A diœcious vine; the branches glabrous, terete, brown to black when dry, 1.5 to 3 mm in diameter. Leaves chartaceous, oblong-elliptic to ovate-elliptic, 7 to 9.5 cm long, 3.5 to 4.5 cm wide, base subequilaterally subacute, 5-nerved, apex acutely acuminate, gla-

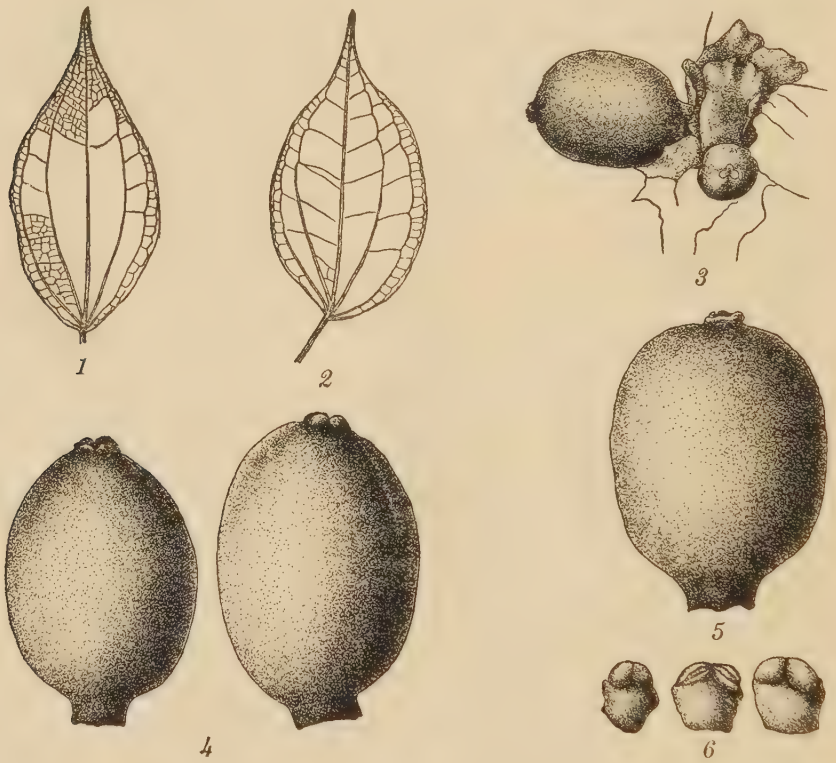

FIG. 88. *Piper pulogense* C. DC.; *1–2*, leaves, × 0.5; *3*, portion of pistillate spike, × 5; *4–5*, fruits, × 7.5; *6*, stamens, × 7.5.

brous on both surfaces; petioles glabrous, 1 to 1.5 cm long. Pistillate spikes pendulous, interrupted, 7.5 to 8.5 cm long, about 1 cm in diameter; the peduncles glabrous, 2.5 to 3 cm long; rachis glabrous; bracts long, adnate to the rachis, margins and apex free, glabrous, oblong-obovate, 2.5 to 3 mm long, 1.5 to 2 mm wide at the apex; fruits free, subsessile, oblong, 4 to 5.5 mm long, 2.5 to 3.5 mm in diameter, glabrous, black, the pedi-

cels up to 0.5 mm in length; stigmas 3 or 4, rounded, sessile, apical. Staminate spikes elongated, pendulous, 11 to 13.5 cm long, 2 to 2.5 mm in diameter; the peduncles glabrous, 1.5 to 2 cm long; rachis glabrous; bracts long, adnate to the rachis, margins and apex free, glabrous, membranaceous, oblong, rounded, 2.5 to 3 mm long, 0.75 to 1.2 mm wide at the apex, inflexed; stamens 2 or 3, pedicellate, 0.75 to 0.9 mm long, anthers subglobose, 2-valved, filaments oblong, about twice as long as the anthers.

LUZON, Benguet Subprovince, Mount Pulog, *For. Bur. 16240 Curran, Merritt, and Zschokke* (type of *Piper pulogense* C. DC. in herb. Manila); Mount Tonglon, *Philip. Pl. 749 Merrill.* In forests at high altitudes, ascending to 2,200 meters. Endemic.

This species, obviously allied to *Piper interruptum* Opiz, differs in its glabrous rachis and oblong fruits.

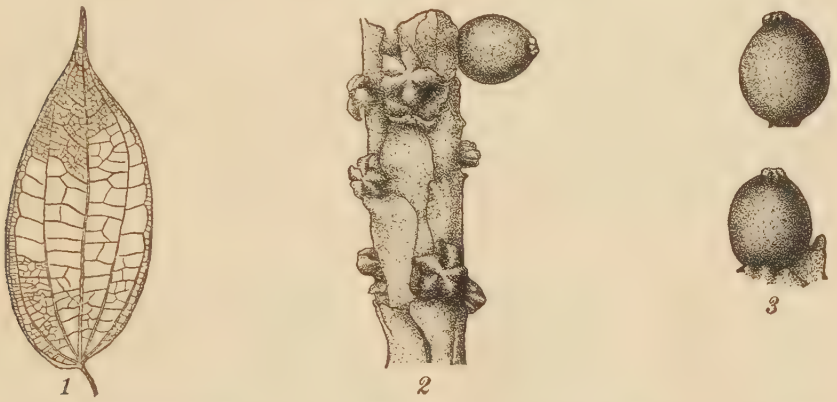

FIG. 89. *Piper multistigmum* C. DC.; *1*, leaf, × 0.5; *2*, portion of pistillate spike, enlarged; *3*, fruits, enlarged.

75. PIPER MULTISTIGMUM C. DC. Text fig. 89.

Piper multistigmum C. DC. in Philip. Journ. Sci. 11 (1916) Bot. 222, Candollea 1 (1923) 216; MERR., Enum. Philip. Fl. Pl. 2 (1923) 12.

A dicœcious vine; the branches glabrous, terete, brown, 1.5 to 2 mm in diameter. Leaves chartaceous, oblong, 8.5 to 9.7 cm long, 3 to 4 cm wide, base equilaterally to subequilaterally subrounded, 5-nerved, apex acutely acuminate, glabrous on both surfaces, reticulations more or less prominent on both surfaces; petioles glabrous, 1 to 1.5 cm long. Pistillate spikes elongated, pendulous, interrupted, 8 to 15 cm long, about 0.8 cm in diameter; the peduncles glabrous, 1 to 2 cm long; rachis pilose;

bracts long, adnate to the rachis, margins and apex free, glabrous, oblong-obovate, subobtuse to truncate, about 5.5 cm long, 1 mm wide at the apex; fruits free, sessile, very rarely subsessile, ovoid-globose, 3 to 4 mm long, 2.5 to 3 mm in diameter, glabrous, black; stigmas 5 or 6, linear, acute.

LUZON, Ifugao Subprovince, Mount Polis, *Bur. Sci. 19819 McGregor* (type collection). Endemic.

An endemic species, in most characters closely resembling *Piper interruptum* Opiz but differing in the number of stigmas which is 5 or 6.

76. PIPER SPATHELLIFERUM sp. nov. Text fig. 90; Plate 15.

Frutex dioicus, scandens; ramulis glabris, laevis, obscure canaliculatis, teretibus, 1.5 ad 3.5 mm diametro; foliis subchartaceis, lanceolatis, 10 ad 11.5 cm longis, 2 ad 3.3 cm latis, basi aequilateralibus ad subaequilateralibus acutis, 5-nerviis, apice attenuatis, subtus fusco-punctulatis; petiolo glabro, 0.8 ad 1.3 cm longo; spicis ♀ 10 ad 16.5 cm longis, 1 cm diametro; pedunculis glabris, 1.5 ad 2.5 cm longis; rachis glabris; bracteis longis, ad rachis adnatis, spathulatis, apice marginibusque liberis, 4 ad 5 mm longis, 1.5 ad 2.5 mm latis; baccis glabris, in sicco nigris, sessilibus, liberis, oblongis, 4 ad 4.5 mm longis, 2.5 ad 3.2 mm diametro, apice obtusis ad rotundatis; stigmatibus 3 vel 4, ovoideis, acutis, sessilibus, adpressis, obscuris.

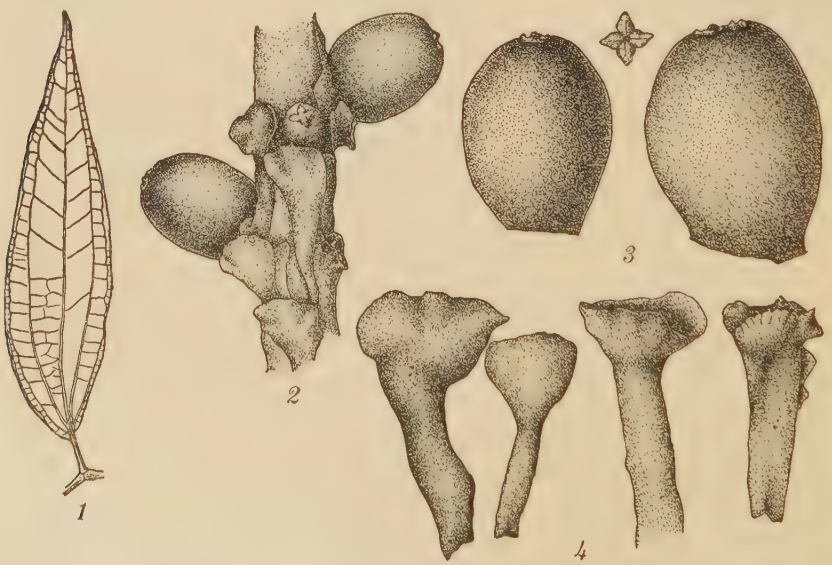

FIG. 90. *Piper spathelliferum* sp. nov.; *1*, leaf, × 0.5; *2*, portion of pistillate spike, × 5; *3*, two fruits and top view of stigmas, × 7.5; *4*, top view of bracts, × 10.

A diœcious vine; the branches glabrous, terete, 1.5 to 3.5 mm in diameter. Leaves subchartaceous, lanceolate, 10 to 11.5 cm long, 2 to 3.3 cm wide, base equilaterally to subequilaterally acute, 5-nerved, apex acutely acuminate, the lower surface with brown glandular dots, glabrous on both surfaces, reticulations obscure to obsolete on both surfaces; petioles glabrous, 0.8 to 1.3 cm long, in the lower leaves up to 2 cm in length. Pistillate spikes greatly elongated, pendulous, interrupted, 10 to 16.5 cm long, about 1 cm in diameter; the peduncles glabrous, 1.5 to 2.5 cm long; rachis glabrous; bracts long, adnate to the rachis, margins and apex free, glabrous, spathulate, 4 to 5 mm long, 1.5 to 2.5 mm wide at the apex; fruits free, sessile, oblong, 4 to 4.5 mm long, 2.5 to 3.2 mm in diameter, black when dry, glabrous, apex obtuse to rounded; stigmas 3 or 4, ovoid, acute, obscure, sessile, apical.

LUZON, Nueva Ecija Province, Mount Umingan, *Bur. Sci. 26383 Ramos and Edaño* (type in herb. Manila), August 20, 1916. A climbing vine on a small tree, in forests, on slopes near the summit of Mount Umingan, altitude about 400 meters.

The species is similar to *Piper elliptibaccum* C. DC. in most of its vegetative characters, but differs in the presence of glandular brown dots on the lower surface of the lamina. The most striking features are the long spathulate bracts, the oblong fruits, and the glabrous rachis.

77. **PIPER ELLIPTIBACCUM** C. DC. **Text fig. 91.**

Piper elliptibaccum C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 449, Candollea 1 (1923) 215; MERR., Enum. Philip. Fl. Pl. 2 (1923) 8.

A diœcious vine; the branches glabrous, terete, 1.5 to 2 mm in diameter. Leaves chartaceous, lanceolate, 6.5 to 13.5 cm long, 1.5 to 3.8 cm wide, base equilaterally to subequilaterally acute, 5-nerved, rarely 5-plinerved, apex attenuate, glabrous on both surfaces, reticulations somewhat obscure to obsolete on both surfaces; petioles glabrous, 0.5 to 1 cm long, in the lower leaves up to 2.5 cm in length. Pistillate spikes greatly elongated, pendulous, interrupted, 9.5 to 15.5 cm long, about 0.8 cm in diameter; the peduncles glabrous, 1.5 to 2.5 cm long; rachis hirtellous; bracts long, adnate to the rachis, margins and apex free, glabrous, oblong-obovate, about 2.5 mm long, 1.5 mm wide at the apex; fruits free, sessile, elliptic-ovoid, 4 to 4.5 mm long, 2.5 to 3 mm in diameter, black, glabrous; stigmas 3 or 4, linear, acute, sessile, apical.

LUZON, Ilocos Norte Province, Bangui to Claveria, *Bur. Sci. 33025 Ramos:* Isabela Province, San Mariano, *Bur. Sci. 46951*

FIG. 91. *Piper elliptibaccum* C. DC.; *1*, leaf, × 0.5; *2*, pistillate bract, × 7.5; *3*, fruits, × 7.5.

Ramos and Edaño: Camarines Sur Province, Maagnas, *Bur. Sci. 6344 Robinson* (type of *Piper elliptibaccum* in herb. Manila). CATANDUANES, Santo Domingo River, *Bur. Sci. 30385 Ramos.* In forests at low and medium altitudes, ascending to 330 meters. Endemic.

This species in its more significant characters is very near *Piper interruptum* Opiz, but differs in having lanceolate leaves and elliptic-ovoid fruits.

78. PIPER CLEMENSIAE C. DC. Text fig. 92.

Piper clemensiae C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 449, Candollea 1 (1923) 215; MERR., Enum. Philip. Fl. Pl. 2 (1923) 6.

A dicœcious vine; the branches glabrous, terete, olivaceous, 2.5 to 4.5 mm in diameter. Leaves subcoriaceous, somewhat rugose, olivaceous, broadly ovate, 10.5 to 11.8 cm long, 6.5 to 7.5 cm wide, base equilaterally rounded, in the lower leaves cordate, 7-plinerved, apex acutely acuminate, glabrous on both surfaces, reticulations more or less obscure on both surfaces; petioles glabrous, 1.5 to 2 cm long, in the lower leaves up to 3.5 cm in length. Pistillate spikes greatly elongated, pendulous, interrupted, 22 to 34.5 cm long, about 1 cm in diameter; the peduncles glabrous, about 3 cm long; rachis hirsute; bracts long, adnate to the rachis, margins and apex free, oblong, 3.5 to 4.5 mm long, about 1.5 mm wide at the apex, glabrous; fruits free, sessile, oblong-ovoid to ovoid, 5 to 6 mm long, 3 to 3.5 mm in diameter, glabrous; stigmas 3, ovoid, fleshy, sessile, apical.

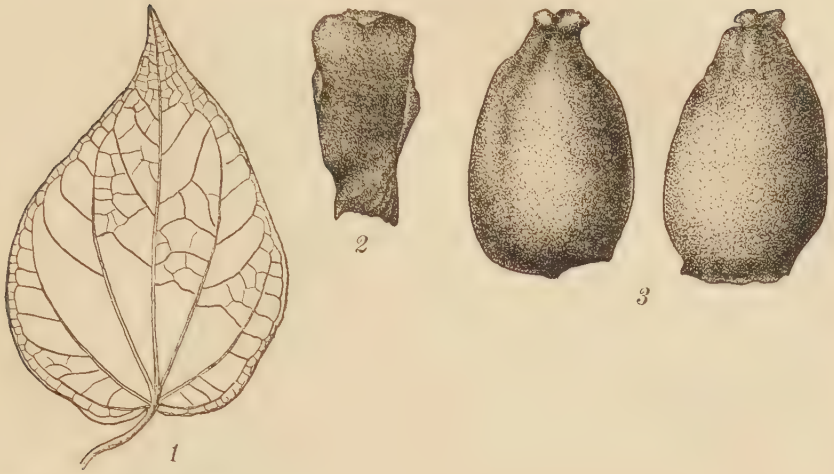

FIG. 92. *Piper clemensiae* C. DC.; *1*, leaf, × 0.5; *2*, pistillate bract, × 7.5; *3*, fruits, × 7.5.

MINDANAO, Lanao Province, Camp Keithley, Lake Lanao, *Clemens 1200* (type in herb. Manila). Endemic.

A species closely allied to *Piper interruptum* Opiz, differing in its broadly ovate, subcoriaceous, rugose, olivaceous leaves and longer bracts.

79. PIPER NIGRUM Linn. var. TRIOICUM (Roxb.) C. DC. Text fig. 93; Plate 16.

Piper nigrum LINN., Sp. Pl. (1753) 28, var. *trioicum* (Roxb.) C. DC., Prodr. 16[1] (1869) 363, Candollea 1 (1923) 218; MERR., Enum. Philip. Fl. Pl. 2 (1923) 12.

Piper trioicum ROXB., Fl. Ind. 1 (1832) 151; MIQ., Syst. Pip. (1843) 310, Nov. Act. Acad. Nat. Cur. 21 (1846) Suppl. 51, *t. 51–52*.

Piper glabrispicum C. DC. in Perk. Frag. Fl. Philip. (1905) 155, Philip. Journ. Sci. 5 (1910) Bot. 451, Candollea 1 (1923) 217; MERR., Enum. Philip. Fl. Pl. 2 (1923) 9.

A triœcious vine; the branches glabrous, terete, 2 to 3.5 mm in diameter. Leaves chartaceous to subcoriaceous, ovate to oblong-elliptic, 7 to 11.5 cm long, 3.5 to 6.5 cm wide, base inequilaterally subacute to acute, 7-plinerved, apex shortly and acutely acuminate, glabrous on both surfaces, reticulations somewhat obscure above, more or less prominent beneath; petioles glabrous, 10 to 20 mm long. Hermaphroditic spikes suberect to pendulous, 4 to 8.5 cm long, about 0.8 cm in diameter; the peduncles glabrous, 7 to 15 mm long; rachis hirsute; bracts adnate to the rachis, margins and apex free, fleshy, oblong, glabrous above and on the margins; fruits with peculiar peppery odor and hot taste, sessile, not crowded, globose, rounded, about 4 mm long, 3 mm in diameter; stigmas 3 or 4, lanceolate, sessile,

FIG. 93. *Piper nigrum* Linn. var. *trioicum* (Roxb.) C. DC.; *1–3*, leaves, × 0.5; *4*, portion of spike, × 7.5; *5*, top view of bract, × 7.5; *6*, stamens, × 10.

apical. Stamens 2, inserted at the base of the fruits or ovaries, about 1 mm long, anthers ovoid, bilocular, 2-valved, filaments oblong, twice as long as the anthers. Female spikes pendulous, 6.5 to 10.5 cm long; the peduncles glabrous, 15 to 23 mm long; rachis glabrous; bracts like the hermaphroditic ones, up to 4 mm in length; ovaries free, ovoid, sessile, stigmas 3, ovoid, acute, sessile, apical.

LUZON, Bataan Province, Lamao, *Bur. Sci. Quisumbing 76564:* Cavite Province, Mendez Nuñez, *Bur. Sci. 1339 Mangubat:* Laguna Province, Los Baños, *Juliano 1079a:* Batangas Province, Balayan, *Merr. Sp. Blancoanae 585.* MINDANAO, Davao Province, Taumo, *Warburg 14748* (type of *Piper glabrispicum* C. DC. in herb. Berlin).

Cultivated in all the tropical countries of the old world, and also in Brazil and in the West Indies. The Linnaean species was correctly interpreted by Blanco, the Philippine form being referable to the var. *trioicum* (Roxb.) C. DC. The pepper plant is cultivated only to a limited extent in the Philippines, and is known as *pimienta* (Sp.); *pamintá* and *malisa* (Tag.).

This variety is characterized by having ovate to oblong-elliptic leaves, by possessing fruits which are globose, black, aromatic in odor and hot in taste, and by being tricœcious.

Section SARCOSTEMON

C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 413, Candollea 1 (1923) 71.

Leaves broadly elliptic-ovate to elliptic-lanceolate, 7- to 9-plinerved, base acute, rarely obtuse, rounded, or cordate. Spike solitary, leaf-opposed, greatly elongated and interrupted. Flowers dicœcious. Bracts adnate to the rachis, margins and apex free. Fruits free, sessile. Stamen 1, filament swollen, fleshy.

80. PIPER KORTHALSII Miq. Text figs. 94 and 95.

Piper korthalsii MIQ. in Ann. Mus. Bot. Lugd.-Bat. 1 (1863) 139; C. DC., Prodr. 16[1] (1869) 365, Philip. Journ. Sci. 5 (1910) Bot. 414 (incl. var. *longibracteum* C. DC.), Leafl. Philip. Bot. 3 (1910) 763, Candollea 1 (1923) 71; MERR., Enum. Philip. Fl. Pl. 2 (1923) 10.

Piper cristatum C. DC. in Leafl. Philip. Bot. 3 (1910) 770, Philip. Journ. Sci. 5 (1910) Bot. 428, Candollea 1 (1923) 198; MERR., Enum. Philip. Fl. Pl. 2 (1923) 7.

A dicœcious vine; the branches glabrous, terete, angled, 2.5 to 8 mm. in diameter. Leaves chrataceous to subcoriaceous, broadly elliptic-ovate to elliptic-lanceolate, 10 to 21 cm long, 3.5 to 14 cm wide, base equilaterally to inequilaterally acute, rarely obtuse, rounded, or cordate, 7- to 9-plinerved, apex acute to shortly and acutely acuminate, glabrous on both surfaces, reticulations somewhat prominent on both surfaces; petioles glabrous, 12 to 25 mm long, in the lower leaves up to 50 mm in length. Pistillate spikes greatly elongated, pendulous, 13 to 25 cm long, about 1.5 cm in diameter; the peduncles glabrous, 15 to 40 mm long; rachis glabrous to hirtellous; bracts adnate to

FIG. 94. *Piper korthalsii* Miq.; *1–4*, leaves, × 0.5; *5*, pistillate spike, × 0.5; *6*, part of pistillate spike, with crowded submature fruits, × 0.5; *7*, portion of staminate spike, × 0.5.

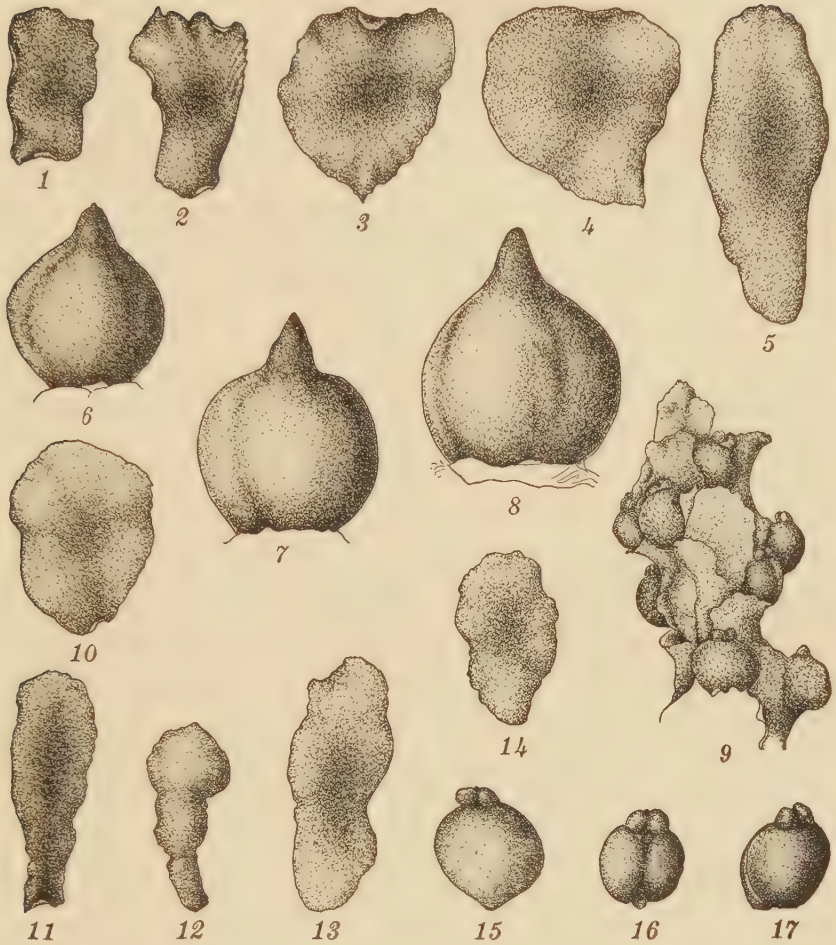

FIG. 95. *Piper korthalsii* Miq.; *1–5*, pistillate bracts, × 7.5; *6–8*, fruits, × 2.5; *9*, portion of staminate spike, × 7.5; *10–14*, staminate bracts, × 7.5; *15–17*, stamens in different views, × 10.

the rachis, margins and apex free, oblong to subrounded-obovate, 3 to 6 mm long, 1.5 to 3.5 mm wide, membranaceous, glabrous above and on the margins; ovaries ovoid-oblong, angled; fruits sessile, without a hot taste, somewhat crowded, ovoid, 5 to 8 mm long, 5 to 7.5 mm in diameter, apex rostrate-attenuate, acute; stigmas 3 or 5, lanceolate, puberulent, sessile, apical. Staminate spikes greatly elongated, pendulous, 12.5 to 31 cm long, 5 to 6 mm in diameter; the peduncles glabrous, 12 to 25 mm long; rachis hirtellous; bracts adnate to the rachis, margins and

apex free, imbricate, membranaceous, oblong to subspathulate, 3 to 5 mm long, 1.5 to 2.5 wide, glabrous above and on the margins; stamen 1, anthers apical, oblong, bilocular, 2-valved, loculi oblong, dehiscence introrse, filament swollen, fleshy, subglobose, exerted when mature, 1.25 to 1.5 mm long, 1 to 1.25 mm in diameter.

LUZON, Cagayan Province, trail from sitio Viola to Mount Nanig, *For. Bur. 19559 Curran:* Isabela Province, San Mariano, *Bur. Sci. 46972 Ramos and Edaño:* Apayao Subprovince, Abulug River, *Weber 1567;* Tamoe, *Bur. Sci. 13881 Ramos;* Guiniri, *Bur. Sci. 28228 Fénix:* Bontoc Subprovince, Bonco, *Vanoverbergh 1178, 2360:* Ifugao Subprovince, Mount Polis, *Bur. Sci. 19814 McGregor:* Benguet Subprovince, Sablang, *Philip. Pl. 471 Fénix;* San Fernando trail, *Merrill 7805;* Baguio, *Elmer 5896 5905, Bur. Sci. 2503 Mearns, Williams 1066:* Nueva Viscaya Province, Campote, *Bur. Sci. 14150 McGregor:* Rizal Province, Mount Irig, *Bur. Sci. 41884 Ramos;* Mount Irid, *Bur. Sci. 48427 Ramos and Edaño;* Montalban, *Loher 12609;* without definite locality, *Loher 14883, 15104:* Laguna Province, San Antonio, *Baker 3718, Bur. Sci. 10974, 16535, 23816 Ramos:* Tayabas Province, Casiguran, *Bur. Sci. 45559 Ramos and Edaño.* MINDORO, Mount Halcon, *Merrill 5592, Bur. Sci. 40702 Ramos and Edaño;* Pinamalayan, *Bur. Sci. 41113 Ramos;* Bongabong River, *For. Bur. 3702 Merritt.* LEYTE, Dagami, *Wenzel 470;* Jaro, Buenavista, *Wenzel 578, 638, 1107, 1130.* PANAY, Antique Province, Culasi, *Bur. Sci. 32295 McGregor:* Capiz Province, Jamindan, *Bur. Sci. 30863, 31014, 31311 Ramos and Edaño;* Mount Agramilig, *Bur. Sci. 46164 Edaño.* MINDANAO, Surigao Province, Surigao, *Bur. Sci. 34544 Ramos and Pascasio;* Placer, *Wenzel 2533:* Agusan Province, Cabadbaran, Mount Urdaneta, *Elmer 13726:* Lanao Province, Camp Keithley, Lake Lanao, *Clemens 463* (type collection of *Piper korthalsii* Miq. var. *longibracteum* C. DC.): Davao Province, Todaya, Mount Apo, *Elmer 10713* (type collection of *Piper cristatum* C. DC.). In forests at low, medium, and high altitudes, ascending to 2,000 meters. Sumatra.

Local names: Busok-búsok (Bag.); buyok-búyok (C. Bis.); dagóg (Mbo.); danód (Ig.); tápi (Ig.).

This species is characterized by having only one stamen. The anthers are borne on fleshy, swollen, subglobose filaments. The fruits are large, ovoid, with rostrate-attenuate apex; the bracts are adnate to the rachis with margins and apex free.

Section MULDERA

HOOK. f. in Fl. Brit. Ind. 5 (1890) 79; MIQ., Comm. Phyt. 34 (genus); *Schizonephros* GRIFF., Notul. 4 (1854) 383 (genus); C. DC., Prodr. 16[1] (1869) 241 (section), Candollea 1 (1923) 68.

Leaves oblong-elliptic, oblong-ovate or rounded-ovate, base acute to rounded, 5- to 7-plinerved. Spike solitary, leaf-opposed. Flowers diœcious. Bracts connate to the rachis, with ends fusing and forming sessile or stipitate cupular receptacles. Fruits distinctly remote, borne on sessile or stipitate cupular receptacles. Stamens 5 or 8, sunk in a cupular receptacle. India, Malaysia.

Key to the species.

1. Cupular receptacle sessile to subsessile, stamens 5..... 81. *P. baccatum.*
1. Cupular receptacle stipitate, stamens 8..... 82. *P. sarcopodum.*

81. PIPER BACCATUM Blume. Text fig. 96; Plate 17, fig. 3.

Piper baccatum BLUME in Verh. Bat. Genoots. 11 (1826) 172, *t. 3;* C. DC., Prodr. 16[1] (1869) 241, Philip. Journ. Sci. 5 (1910) Bot. 462, Candollea 1 (1923) 70; MERR., Enum. Philip. Fl. Pl. 2 (1923) 4.
Muldera baccata MIQ., Syst. Pip. (1843) 341, Nov. Act. Acad. Nat. Cur. 21 (1846) Suppl. 58, *t. 59.*

A diœcious vine; the branches glabrous, terete, 2 to 4 mm in diameter. Leaves coriaceous, oblong-elliptic or rounded-ovate, 12 to 16.5 cm long, 4 to 9.5 cm wide, base equilaterally to subequilaterally acute to rounded, 5- to 7-plinerved, apex acutely acuminate, glabrous on both surfaces, reticulations somewhat obscure on both surfaces; petioles glabrous, 0.7 to 1.8 cm long, in the lower leaves up to 3 cm long. Pistillate spikes pendulous, 4.5 to 9.5 cm long, about 1.5 cm in diameter; the peduncles glabrous, 2 to 3 cm long; rachis glabrous, 1.5 to 2 mm in diameter; bracts connate to the rachis, with ends fusing and forming the cupular receptacle, glabrous; fruits globose, borne on the cupular receptacles, 4.5 to 6 mm long, 4 to 5 mm in diameter; stigmas 3 or 4, minutely puberulent, rounded; cupular receptacle sessile to subsessile, stout, glabrous outside, glabrous to ciliate on the rim, pilose inside. Staminate spikes pendulous, slender, 3 to 6 cm long, 2 to 2.25 mm in diameter; the peduncles glabrous, 1.6 to 2 cm long; rachis glabrous, slender, about 0.75 to 1 mm in diameter; bracts like the female; male flowers including the cupular receptacle about 2 mm long, 2 mm in diameter; stamens 5, small, sunk in the cupular receptacle, uniseriate; anthers very small, ovoid to subglobose, bilocular, 2-valved, erect, loculi oblong, filaments oblong, swollen at the base, slightly

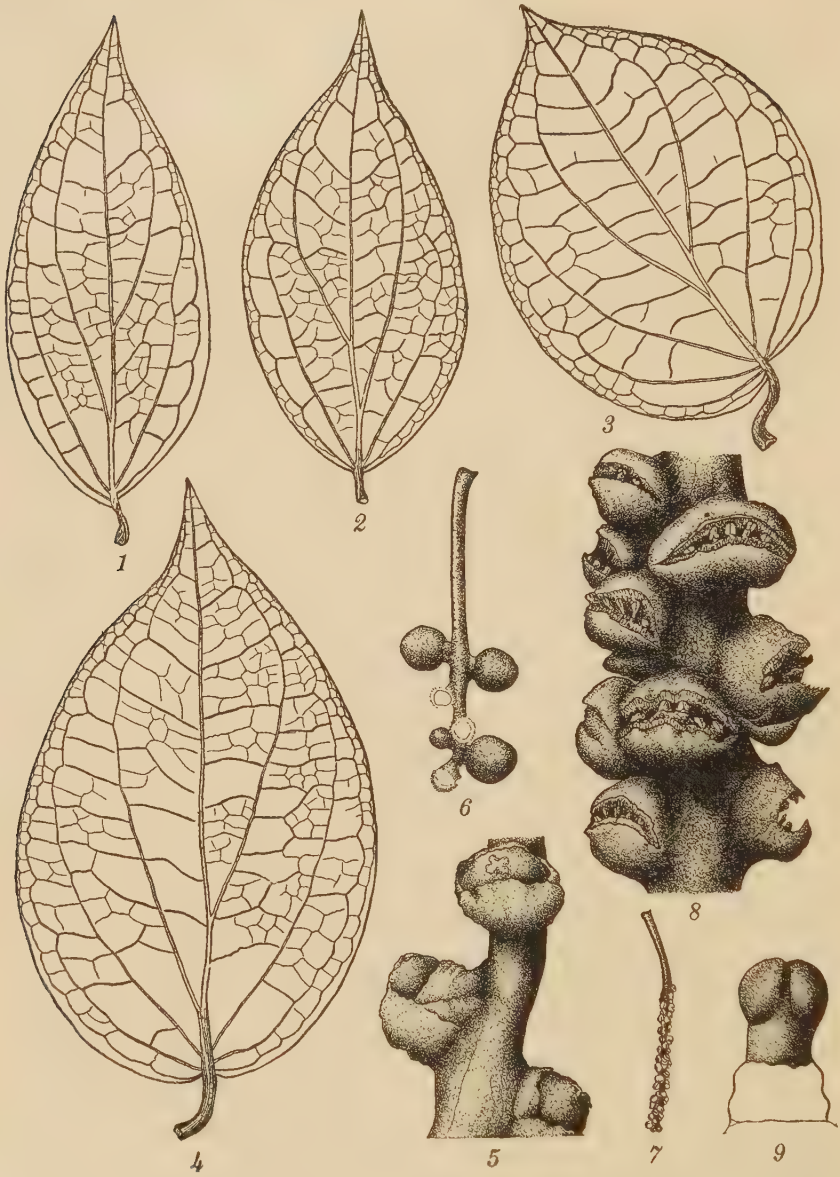

FIG. 96. *Piper baccatum* Blume; *1–4*, leaves, × 0.5; *5*, portion of immature pistillate spike, × 7.5; *6*, mature pistillate spike, × 1; *7*, staminate spike, × 0.5; *8*, portion of staminate spike, × 7.5; *9*, stamen, greatly enlarged.

longer than the anthers; cupular receptacles formed by the bracts, sessile, glabrous on the outside, pilose inside, rim oblique, ciliate, transverse, base constricted, apex rounded.

MINDANAO, Agusan Province, Cabadbaran, Mount Urdaneta, *Elmer 13972, 14210:* Lanao Province, Camp Keithley, Lake Lanao, *Clemens s. n.* 1907. In forests. Borneo, Java.

Local name: Sambañganai (Mbo.).

A species characterized by its fruits borne on sessile to subsessile cupular receptacles, the bracts connate to the rachis, stamens 5, uniseriate, sunken in the cupular receptacles.

82. PIPER SARCOPODUM C. DC. Text fig. 97; Plate 17, fig. 4.

Piper sarcopodum C. DC. in Philip. Journ. Sci. 11 (1916) Bot. 207, Candollea 1 (1923) 69; MERR., Enum. Philip. Fl. Pl. 2 (1923) 4.

A dicœcious vine; the branches glabrous, terete, 1.5 to 4 mm in diameter. Leaves coriaceous, oblong-ovate to subrounded-ovate, 9.5 to 12 cm long, 5 to 7.5 cm wide, base equilaterally to inequilaterally subacute to rounded, 7-plinerved, apex acutely acuminate, glabrous on both surfaces, reticulations more or less obscure beneath; petioles glabrous, 10 to 15 mm long. Pistillate spikes pendulous, 6 to 9.5 cm long, 1.8 to 2.2 cm in diameter; the peduncles glabrous, 20 to 27 mm long; rachis glabrous, about 2 mm in diameter; bracts connate to the rachis, with ends fusing and forming the cupular receptacle; fruits distinctly remote, globose, borne on cupular receptacles, 5 to 6 mm long, 4 to 6 mm in diameter; stigmas 4, minute, rounded; cupular receptacles stipitate, stout, glabrous on the outside to very sparingly puberulent near the apex, glabrous on the rim, pilose inside. Staminate spikes pendulous, 4 to 5.5 cm long, 1 to 1.2 cm in diameter; the peduncles puberulent 12 to 28 mm long; rachis puberulent, slender, 0.75 to 1 mm in diameter; bracts like the female; male flowers including the cupular receptacles 5 to 6.75 mm long, 2.75 to 3.25 mm in diameter; stamens 8, minute, sunk in the cupular receptacle, uniseriate, anthers oblong, bilocular, 2-valved, erect, loculi elliptic-oblong, dehiscence apical, filaments oblong, swollen at the base, slightly longer than the anthers; cupular receptacles formed by the bracts, stipitate, puberulent outside, rim puberulent, transverse, not oblique, pilose inside, base constricted, apex obtuse to truncate, stalk slender, puberulent, 3 to 4 mm in length.

LUZON, Laguna Province, San Antonio, *Bur. Sci. 16536* (type collection), *23797 Ramos;* Los Baños, Mount Maquiling, *Elmer 17970:* Sorsogon Province, Irosin, Mount Bulusan, *Elmer 16800.* In forests. Endemic.

This species shows most resemblance to *Piper baccatum* Blume in its vegetative features, but may be readily distinguished

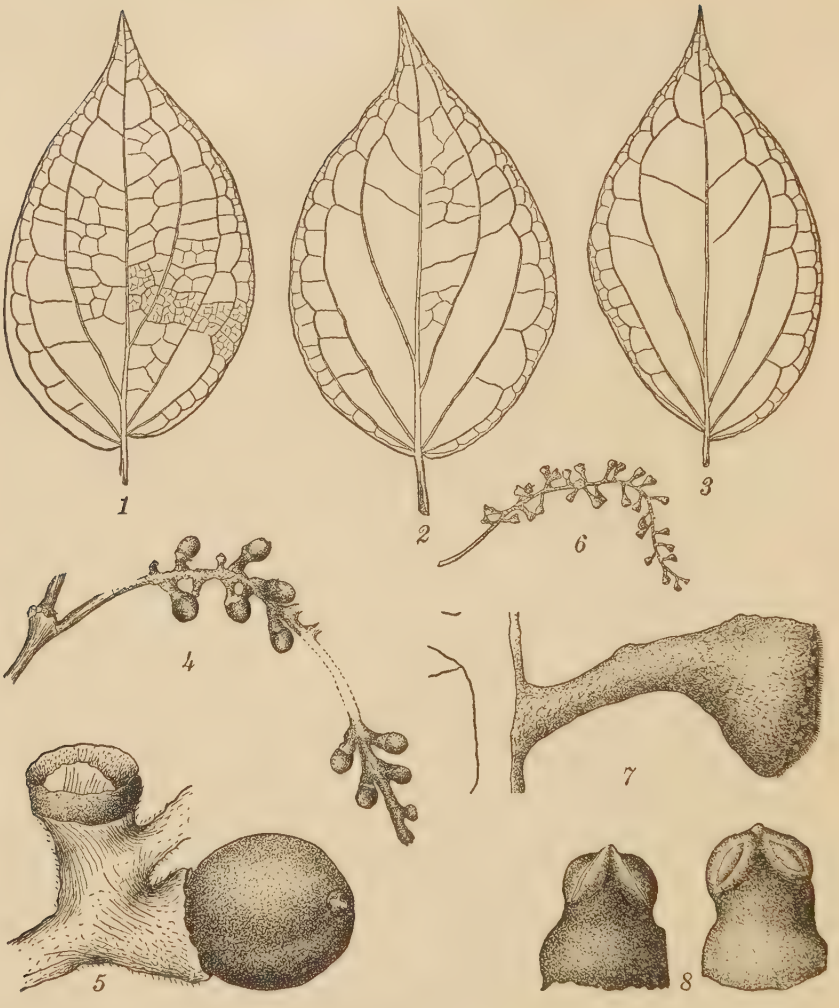

FIG. 97. *Piper sarcopodum* C. DC.; *1–3*, leaves, × 0.5; *4*, pistillate spike, × 0.5; *5*, cupular receptacles and a fruit, × 7.5; *6*, staminate spike, × 0.5; *7*, cupular receptacle with stamens, × 7.5; *8*, stamens, greatly enlarged.

by its prominently stipitate cupular receptacles and in having 8 stamens. *Elmer 16800* is labelled *Piper bulusanum* C. DC. in herb. de Candolle. This name has never been published.

Section PENNINERVIA sect. nov.

Bracteis ♀ a floribus distinctis, longe pedicellatis, peltatis. Floribus dioiceis. Staminibus 2 vel 3, connectivo supra loculo peltatem producto, carnoso. Baccis liberis, sessilibus, plerum-

que confertis. Stigmatibus plerumque 3 vel 4. Spicis oppositifoliis. Foliis penninerviis. Philippines.

Leaves various in form, penninerved. Spike solitary, leaf-opposed. Flowers dicœcious. Bracts free, pedicellate, peltate. Fruits free, sessile, usually crowded. Stamens 2 or 3, the connective above the loculi of the anthers enlarged, fleshy. Stigmas usually 3 or 4. Philippines.

Key to the species.

1. Fruits crowded; stigma not sessile, up to 0.5 mm in length; lamina glaucous beneath.
   2. Lamina entirely glabrous on both surfaces; connective above the loculi subacute to truncate ..... 83. *P. celtidiforme.*
   2. Lamina glabrous above, subglabrous to pubescent on the nerves beneath; connective above the loculi rounded.
      3. Branches glabrous; lamina oblong-elliptic to lanceolate-elliptic; petioles vaginate throughout their whole length with the bases broadly winged and chartaceous, glabrous. 83. *P. celtidiforme* var. *vaginans.*
      3. Branches pubescent; lamina lanceolate to oblong-ovate; petioles somewhat vaginate, pubescent ..... 84. *P. catubigense.*
1. Fruits never crowded; stigma sessile; lamina never glaucous beneath.
   2. Lamina entirely glabrous on both surfaces; fruits never tubercular. 85. *P. penninerve.*
   2. Lamina glabrous above, pubescent beneath; fruits tubercular. 86. *P. villirache.*

83. PIPER CELTIDIFORME Opiz. Text figs. 98, 1–3, and 99.

Piper celtidiforme Opiz in Presl. Rel. Haenk. 1 (1828) 152, *t. 26, f. 2;* C. DC., Prodr. 16[1] (1869) 377, Candollea 1 (1923) 230; F.-Vill., Novis. App. (1880) 76; Merr., Enum. Philip. Fl. Pl. 2 (1923) 6.

Chavica celtidiformis Miq., Syst. Pip. (1843) 276.

Piper corylistachyon C. DC., Prodr. 16[1] (1869) 346 (incl. var. *magnifolia* C. DC.), Philip. Journ. Sci. 5 (1910) Bot. 438 (incl. formæ *b, c, d2* C. DC.), 11 (1916) Bot. 218, Leafl. Philip. Bot. 3 (1910) 776, Candollea 1 (1923) 188, 208; F.-Vill., Novis. App. (1880) 175; Vidal, Phan. Cuming. Philip. (1885) 138, Rev. Pl. Vasc. Filip. (1886) 219; Merr., Sp. Blancoanae (1918) 118.

Chavica corylistachya Miq., Syst. Pip. (1843) 281, Fl. Ind. Bat. 1[2] (1858–59) 447.

Piper obliquum Blanco, Fl. Filip. (1837) 22, ed. 2 (1845) 16, ed. 3, 1 (1877) 30, non Ruiz and Pavon.

Piper warburgii C. DC. in Perk. Frag. Fl. Philip. (1905) 159, Candollea 1 (1923) 285.

A dicœcious vine; the branches glabrous, terete, 1.5 to 5 mm in diameter. Leaves chartaceous, oblong-ovate, 9 to 17.5 cm long, 4 to 8.5 cm wide, base inequilaterally cuneate to rounded, penninerved, primary lateral nerves 4 or 5 or 6 on each side

of the midrib, apex acutely acuminate, glabrous on both surfaces, the lower surface glaucous, sometimes also the upper surface, reticulations usually obscure above, more or less prominent beneath; petioles glabrous, 10 to 15 mm long, in the lower leaves up to 30 mm in length. Pistillate spikes suberect, 1.6 to 4.5 cm long, 0.8 to 1.2 cm in diameter, rarely 6 cm long, 1.6 cm in diameter; the peduncles glabrous, 6 to 14 mm long; rachis villose; bracts long-pedicellate, peltate, 1.5 to 2 mm long, disk somewhat compressed, nearly 4-parted, glabrous above and on the margins, about 1 mm wide, pedicels villose; fruits crowded

FIG. 98. Leaves of: *1–3*, *Piper celtidiforme* Opiz; *4–5*, forma *luzonense* (C. DC.) comb. nov.; *6–7*, forma *usteri* (C. DC.) comb. nov.; *8–9*, forma *tubuanense* forma nov., all × 0.3; *10*, var. *vaginans* var. nov., petiole, base of lamina, and young pistillate spike, × 1.

FIG. 99. *Piper celtidiforme* Opiz; *1*, pistillate bracts, × 10; *2*, stigmas, × 10; *3–4*, fruits, × 7.5; *5*, top and side views of staminate bracts, × 10; *6*, stamens, × 10.

with their bases partly embedded in and concrescent with the rachis, minute, ovoid, obovoid or oblong, 1.75 to 2.75 mm long, 1 to 1.5 mm in diameter; stigmas 3, rarely 4, linear, up to 5 mm in length, usually deciduous in the mature fruits. Staminate spikes suberect to subpendulous, cylindric, slender, 5 to 11.5 cm long, rarely 2.5 to 3.5 cm long, 4.5 to 5 mm in diameter; the peduncles glabrous, 3 to 3.2 cm long; rachis villose; bracts pedicellate, peltate, 0.75 to 1 mm long, disk glabrous above and on the margins, obovate to orbicular, 0.75 to 1 mm wide; stamens 2 or 3, usually 3, subsessile to pedicellate, very crowded, 0.75 to 1.25 mm long, anthers oblong, the connective above the loculi enlarged, peltate, fleshy, subacute to truncate, tetralocular, 4-valved, filaments somewhat exerted.

LUZON, without definite province and locality, *Haenke s. n.* 1792 (type of *Piper celtidiforme* Opiz in herb. Prague): Ilocos Norte Province, Bangui to Claveria, *Bur. Sci. 32967, 32987 Ramos:* Ilocos Sur Province, without definite locality, *Cuming 1044* [type of *Piper corylistachyon* C. DC. (*Chavica corylistachya* Miq.) in herb. Kew; isotype in herb. Manila]: Pangasinan Province, Umingan, *Bur. Sci. 18338 Otanes:* Nueva Ecija Prov-

ince, Caranglang, *Merrill 238:* Pampanga Province, Mount Abu, *Bur. Sci. 1989 Foxworthy;* Mount Arayat, *Warburg 13319, Merrill 1448, Bolster 21:* without definite province (central Luzon), Sampaloc, *Warburg 13116* (type of *Piper warburgii* C. DC. in herb. Berlin; isotype in herb. Manila); Bordeos, *Warburg 13320;* Mount Alban, *Warburg 12662:* Zambales Province, Anuling, *Bur. Sci. 44638 Ramos and Edaño;* Lamao River, Mount Mariveles, *Whitford 1280:* Rizal Province, Montalban, *Merr. Sp. Blancoanae 849;* Binangonan, *Warburg 13321;* Bosoboso, *Vidal 3541;* Antipolo, *Ramos s. n.;* Calamis River, *Bur. Sci. 13424 Ramos;* without definite locality, *Loher 14331:* Laguna Province, Paete, *Bur. Sci. 27859 McGregor;* San Antonio, *Bur. Sci. 12030, 20527 Ramos;* Los Baños, *Baker 1074;* Santa Cruz, *Gates and Teodoro 6498:* Tayabas Province, Tagcauayan, *Bur. Sci. 13324 Ramos;* Lucban, *Bur. Sci. 47401 McGregor, Elmer 8201a;* Infanta, *Bur. Sci. 6805 Robinson, Whitford 852:* Camarines Sur Province, without definite locality, *Vidal 1674:* Sorsogon Province, Mount Lalao, *Bur. Sci. 23406 Ramos.* POLILIO, *Bur. Sci. 6966, 6918 Robinson.* CARCRARAY (Albay Province), *Bur. Sci. 6407 Robinson.* SAMAR, Loquilocon, *Bur. Sci. 43808 McGregor;* without definite locality, *Vidal 512.* LEYTE, Tigbao, *Wenzel 1570.* PANAY, Iloilo Province, Suague River, *Bur. Sci. 18153 Robinson:* Antique Province, Tibiao, *Bur. Sci. 32296 McGregor.* BILIRAN, *Bur. Sci. 18775 McGregor.* In forests and thickets at low and medium altitudes, ascending to 250 meters. Endemic.

Local names: Litlít (Tag.); litlit-aníto (Tag.).

This characteristic species is easily distinguished from other known species of the Philippines by its peculiar anthers, the connective above the loculi enlarged, peltate and fleshy. It is further characterized by its crowded fruits, nearly 4-parted bracts, and the glaucous lower surfaces of the leaves.

Forma LUZONENSE (C. DC.) comb. nov. Text fig. 98, 4–5.

Piper luzonense C. DC., Prodr. 16[1] (1869) 350, Candollea 1 (1923) 258; F.-VILL., Novis. App. (1880) 175.

Piper reinwardtianum C. DC. in Philip. Journ. Sci. 11 (1916) Bot. 218, non C. DC., Prodr. 16[1] (1869) 354.

Piper corylistachyon C. DC. formæ *d* and *d2* C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 439.

Foliis late oblongo-ovatis ad late ovatis, 12.5 ad 24 cm longis, 6.5 ad 15 cm latis, basi rotundatis ad subcordatis.

LUZON, Apayao Subprovince, Abulug River, *Bur. Sci. 13882 Ramos:* Rizal Province, Bosoboso to Antipolo, *Bur. Sci. 42184 Ramos;* Atimonan, *Baker 3334;* Tanay, *Merrill 2306;* Sumag,

Loher 14116: Laguna Province, Pangil, *Bur. Sci. 27873 McGregor;* Paete, *Bur. Sci. 20525 Ramos;* Los Baños, Mount Maquiling, *Elmer 17774;* Lilio, *Elmer 6014:* Tayabas Province, Atimonan, *Gregory 110* (type collection of *Piper corylistachyon* C. DC. forma *d2* C. DC.) ; Mount Binuang, *Bur. Sci. 28520 Ramos and Edaño;* Casiguran, *Bur. Sci. 45202 Ramos and Edaño:* Camarines Sur Province, Niog, *Philip. Pl. 1575 Ramos:* Albay Province, Mount Mayon, *Bur. Sci. 6462 Robinson:* Sorsogon Province, Irosin, Mount Bulusan, *Elmer 16224, 16225:* without definite province or locality, *Jagor 722* (type of *Piper luzonense* C. DC. in herb. Berlin). POLILLO, *Bur. Sci. 10235 McGregor.* MARINDUQUE, unknown collector. MINDORO, Paluan, *Bur. Sci. 39700 Ramos;* Pinamalayan, *Bur. Sci. 40900 Ramos.* SAMAR, Catbalogan, *Bur. Sci. 17420 Ramos.* LEYTE, without definite locality, *For. Bur. 11572 Whitford;* Tigbao, *Wenzel 1487.* CEBU, Catmon, *For. Bur. 12434 Danao.* NEGROS, *Piper 18.* PANAY, Iloilo Province, Tigom River, *Bur. Sci. 18134 Robinson* (determined by C. de Candolle as *Piper reinwardtianum* C. DC.) : Capiz Province, Mount Bomlon, *Bur. Sci. 21230 Escritor;* Jamindan, *Bur. Sci. 31225 Ramos and Edaño.* BILIRAN, *Bur. Sci. 18785 McGregor.* MINDANAO, Surigao Province, Surigao, *Bur. Sci. 34426 Ramos and Pascasio:* Davao Province, Baganga, *Bur. Sci. 15859 Fénix.* In forests and thickets at low and medium altitudes, ascending to 650 meters. Endemic.

Local names: Baligágod (Neg.) ; buyo-bóyo (Bis.) ; litlít-aníto (Tag.) ; litlít-báboy (Tag.) ; litlít-matsíng (Tag.).

This form differs from the species by its larger leaves with rounded to subcordate bases.

Forma USTERI (C. DC.) comb. nov. Text fig. 98, 6–7.

Piper usteri C. DC. in Vierteljahrschr. Naturf. Ges. Zürich 50 (1905) 447 [Usteri Beitr. Ken. Philip. Veg. (1905) 125], Fedde Repert. 5 (1908) 64, Candollea 1 (1923) 284, Philip. Journ. Sci. 5 (1910) Bot. 439.

Piper corylistachyon C. DC. forma *c* C. DC. in Philip. Journ. Sci. 5 (1910) 439.

Foliis late oblongo-ellipticis ad late ovatis, 13 ad 21.5 cm longis, 6 ad 14 cm latis, basi subacutis ad acutis.

LUZON, Rizal Province, Antipolo, *Bur. Sci. 11867 Robinson and Ramos, Philip. Pl. 272 Ramos;* without definite locality, *Loher 14338, 15111:* Laguna Province, *Bur. Sci. 23811 Ramos;* Los Baños, *For. Bur. 20367 Villamil:* Tayabas Province, Atimonan, *Whitford 733;* Infanta, *Bur. Sci. 6806 Robinson:* Sorsogon Province, Irosin, Mount Bulusan, *Elmer 16507.* MINDORO,

McGregor 331; Lake Naujan, *For. Bur. 6875 Merritt;* Cauayan, *For. Bur. 4113.* SAMAR, Lanang, *Merrill 5236.* GUIMARAS, *Usteri s. n.* (type of *Piper usteri* C. DC. in herb. Manila). BOHOL, Bilar, *Bur. Sci. 42878 Ramos.* PANAY, Capiz Province, Mount Madiaas, *Bur. Sci. 30628 Ramos and Edaño;* Jamindan, *Bur. Sci. 31068, 31093 Ramos and Edaño;* Agraman, *Bur. Sci. 46142 Edaño;* Locero, *Bur. Sci. 46107, 46183 Edaño:* Antique Province, Culasi, *Bur. Sci. 32308 McGregor.* MINDANAO, Surigao Province, Surigao, *Piper 208;* Placer, *Wenzel 1881:* Zamboanga Province, Malangas, *Bur. Sci. 37031 Ramos and Edaño.* In forests and thickets at low and medium altitudes, ascending to 250 meters. Endemic.

Local names: Buyo-bóyo (Bis.); litlít-mátsing (Tag.).

This form differs from the preceding one by its leaves with bases subacute to acute.

Forma TUBUANENSE forma nov. Text fig. 98, 8–9.

Foliis lanceolatis ad elliptico-lanceolatis, 9 ad 20.5 cm longis, 3 ad 6.5 cm latis, basi acutis.

Leaves lanceolate to elliptic-lanceolate, 9 to 20.5 cm long, 3 to 6.5 cm wide, base acute.

MINDORO, Paluan, *Bur. Sci. 39588 Ramos.* LEYTE, Malitbog, *Weber 1523;* Tigbao, *Wenzel 1276.* MINDANAO, Surigao Province, Surigao, *Bur. Sci. 34359 Ramos and Pascasio:* Zamboanga Province, Mount Tubuan, *Bur. Sci. 36704 Ramos and Edaño* (type in herb. Manila); Malangas, *Bur. Sci. 37102, 37272, 37325, 37438 Ramos and Edaño.* BASILAN, *Hallier s. n.* 1904. In thickets and forests at low altitudes.

This form is characterized by its lanceolate to elliptic-lanceolate leaves.

Var. VAGINANS var. nov. Text figs. 98, 10.

Foliis oblongo-ellipticis ad lanceolato-ellipticis, 12 ad 16 cm longis, 3 ad 7 cm latis, basi subaequilateralibus acutis, apice longe et tenuiter acute acuminatis, supra glabris, subtus subglabris vel ad nervis hirtellis; petiolis brevibus, ad basi late vaginatis, membranaceis, 4 ad 8 mm longis.

Leaves oblong-elliptic to lanceolate-elliptic, 12 to 16 cm long, 3 to 7 cm wide, base subequilaterally acute, apex long, slender, and acutely acuminate, glabrous above, subglabrous to hirtellous on the nerves beneath; petioles short, vaginate the whole length, the base broadly winged, the wings membranaceous, 4 to 8 mm long.

LUZON, Ifugao Subprovince, Mount Polis, *Bur. Sci. 19822 McGregor* (type in herb. Manila) : Kalinga Subprovince, Mount Masingit, *Bur. Sci. 37513, 37567 Ramos and Edaño.* In forests, altitude about 1,500 meters.

Notwithstanding the marked foliar differences stated, these plants show such coincidence in inflorescence and other characters as to discourage their treatment as independent species. The striking feature of this variety is the winged petiole.

84. PIPER CATUBIGENSE Merr. Text fig. 100.

Piper catubigense MERR. in Philip. Journ. Sci. 17 (1920) 244, Enum. Philip. Fl. Pl 2 (1923) 6.

A diœcious vine; the branches tomentose, terete, 2 to 3.5 mm in diameter. Leaves membranaceous to chartaceous, lanceolate to oblong-ovate, 11 to 22 cm long, 3.5 to 12.5 cm wide, base subequilaterally obtuse to rounded, penninerved, lateral nerves 6 to 8 on each side of the midrib, apex acutely acuminate, glabrous above, tomentose on the nerves beneath, reticulations, prominent on both surfaces; petioles tomentose, 7 to 12 mm long. Pistillate spikes suberect, short, 17 to 25 mm long, 10 to 15 mm in diameter; the peduncles tomentose, 7 to 13 mm long; rachis tomentose; bracts long-pedicellate, peltate, 1.5 to 2 mm long, disk somewhat compressed, glabrous above and on the margins, about 0.75 mm wide, pedicels somewhat slender, tomentose; fruits crowded, with their bases partly embedded in and concrescent with the rachis, minute, oblong to oblong-obovoid, 2 to 2.5 mm long, 1 to 1.25 mm in diameter; stigmas 3, linear, up to 0.4 mm long, deciduous in the mature fruits. Staminate spikes erect, 5 to 7 cm long, 2.5 to 3.5 mm in diameter, black when dry; the peduncles tomentose, 8 to 13 mm long; rachis tomentose; bracts pedicellate, peltate, about 0.75 mm long, disk glabrous above and on the margins, orbicular, about 1 mm wide; stamens 2 or 3, subpedicellate, crowded, 1 to 1.2 mm long, anthers oblong, to oblong-obovoid, rounded, connective above the loculi enlarged, fleshy, tetralocular, 4-valved, dehiscence lateral, filaments much shorter than the anthers.

CATANDUANES, Calolbong, *Bur. Sci. 30249, 30256 Ramos and Chan.* SAMAR, Catubig River, *Bur. Sci. 24278 Ramos* (type in herb. Manila). In damp forests at low altitudes. Endemic.

A species with reproductive structures clearly resembling those of *Piper celtidiforme* Opiz, differing radically in its pubescent branches, petioles, peduncles, and the nerves on the lamina beneath. The connective of the anthers is rounded.

FIG. 100. *Piper catubigense* Merr.; *1–3*, leaves, × 0.5; *4*, pistillate bract, × 10; *5*, fruits, × 7.5; *6*, top and side views of staminate bracts, × 10; *7*, stamens, × 10.

85. PIPER PENNINERVE C. DC. Text fig. 101.

Piper penninerve C. DC. in Perk. Frag. Fl. Philip. (1905) 157, Philip. Journ. Sci. 5 (1910) Bot. 440, 11 (1916) Bot. 218, Candollea 1 (1923) 210; MERR., Enum. Philip. Fl. Pl. 2 (1923) 13.

A dicœcious vine; the branches glabrous, terete, 1.25 to 3 mm in diameter. Leaves chartaceous, elliptic-lanceolate to broadly oblong-elliptic, 10 to 20 cm long, 3.5 to 8.5 cm wide, base equilaterally to subequilaterally acute, penninerved, lateral nerves 8 to 11 on each side of the midrib, apex acutely acuminate, glabrous on both surfaces, never glaucous beneath, usually dark brown when dry, reticulations somewhat obscure above, prominent beneath; petioles glabrous, 5 to 10 mm long, in the lower leaves up to 15 mm in length. Pistillate spikes rather short, recurved, 1.5 to 2.8 cm long, 5.5 to 8 mm in diameter; the peduncles glabrous, 5 to 17 mm long; rachis villose; bracts long-pedicellate, peltate, 1.75 to 2.25 mm long, disk glabrous above and on the margins, firm, subrounded-obovate, 1 to 1.25 mm wide, pedicels rather stout, villose; fruits never crowded, with their bases about half embedded in and concrescent with the rachis, obovoid to globose-obovoid, usually tetragonous, apex subacute, 2 to 2.5 mm long, 1.5 to 2 mm in diameter; stigmas 3 or 4, rarely 5, ovoid, acute, sessile, apical; seeds reddish black to black, globose-obovoid to globose, 1.5 to 1.75 mm long. Staminate spikes suberect to subpendulous, 4.5 to 9.5 cm long, 1.75 to 2.5 mm in diameter, rarely 2.5 cm long; the peduncles glabrous, 7 to 16 mm long; rachis villose; bracts pedicellate, peltate, 0.5 to 0.75 mm long, disk glabrous above and on the margins, subrounded-obovate, about 0.75 mm wide; stamens, 2, sessile, becoming pedicellate after dehiscence, up to 1.25 mm long, anthers obovoid to subglobose, tetralocular, 4-valved, dehiscence lateral, connective above the loculi enlarged, fleshy, rounded, filaments as long as the anthers, somewhat exerted.

LUZON, Rizal Province, San Isidro, *Bur. Sci. 13396 Ramos;* Mount Angilog, *Bur. Sci. 40775 Ramos;* Mount Irid, *Bur. Sci. 42284 Ramos:* Camarines Sur Province, Bagacay, *Bur. Sci. 33857 Ramos and Edaño.* SAMAR, Catubig River, *Bur. Sci. 24284 Ramos.* LEYTE, Jaro, Buenavista, *Wenzel 719;* Dagami, *Bur. Sci. 15230 Ramos, Wenzel 2, 374.* BOHOL, Bilar, *Bur. Sci. 42877 Ramos.* MINDANAO, Davao Province, Dagatpan, *Warburg 14744* (type in herb. Berlin) : Zamboanga Province, Port Banga, *Bur. Sci. 11818 Robinson.* SIARGAO, *Bur. Sci. 34949 Ramos and Pascasio.* In forests at low, medium, and high altitudes, ascending to 1,300 meters. Endemic.

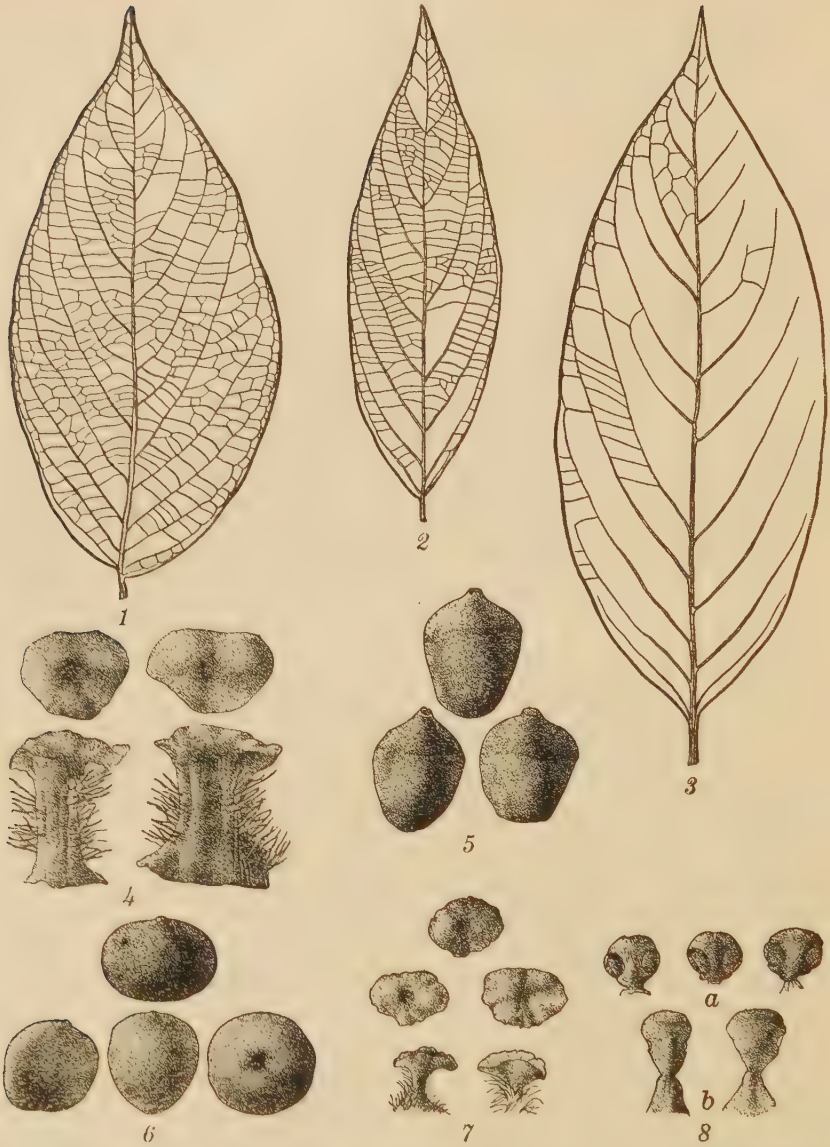

FIG. 101. *Piper penninerve* C. DC.; *1–3*, leaves, × 0.5; *4*, top and side views of pistillate bracts, × 10; *5*, fruits, × 7.5; *6*, different views of seeds, × 7.5; *7*, top and side views of staminate bracts, × 10; *8*, stamens, *a*, before dehiscence; *b*, after dehiscence, × 10.

This species is apparently closely allied to *Piper celtidiforme* Opiz, by its peculiar anthers, differing in its smooth, never glaucous, lower surfaces of the leaves, its fruits never crowded

and more or less embedded in and concrescent with the rachis, and in its sessile stigmas.

86. PIPER VILLIRACHE C. DC. Text fig. 102.

Piper villirache C. DC. in Philip. Journ. Sci. 11 (1916) Bot. 214, Candollea 1 (1923) 285; MERR., Enum. Philip. Fl. Pl. 2 (1923) 17.

Piper longilimbum C. DC. in Philip. Journ. Sci. 11 (1916) Bot. 221, Candollea 1 (1923) 211; MERR., Enum. Philip. Fl. Pl. 2 (1923) 11.

A dicœcious vine; the branches glabrous, subterete, 4 to 8 mm in diameter. Leaves membranaceous to subchartaceous, broadly oblong to broadly oblong-elliptic, 17 to 34 cm long, 8 to 15 cm wide, base subinequilateral, usually acute, rarely obtuse or rounded, penninerved, lateral nerves 7 to 10 on each side of the midrib, apex shortly and acutely acuminate, rarely long-acuminate, covered with conspicuous reddish-brown dots on both

FIG. 102. *Piper villirache* C. DC.: *1–2*, leaves, × 0.3; *3*, leaf base, × 0.3; *4*, top and side views of pistillate bracts, × 6.5; *5*, fruits, × 5; *6*, top and side views of staminate bracts, × 6.5; *7*, stamens, × 6.5.

surfaces, glabrous above, hirsute beneath; petioles sparingly hirsute to hirsute, 10 to 30 mm long, in the lower leaves up to 35 mm in length. Pistillate spikes suberect, elongated, 5 to 7.5 cm long, 5 to 7 mm in diameter; the peduncles glabrous, 10 to 35 mm long; rachis densely villose; bracts long-pedicellate, peltate, 1.75 to 2.25 mm long, disk glabrous above and on the margins, somewhat fleshy, subelliptic to obovate, 1.5 to 2 mm wide, pedicels villose; fruits never crowded, partly embedded in and concrescent with the rachis, globose to globose-ovoid, turbercular near the apex, 2 to 2.25 mm long, 1.75 to 2 mm in diameter; stigmas 3 or 4, oblong, sessile, apical. Staminate spikes suberect to erect, greatly elongated, black when dry, 10.5 to 15 cm long, 2.5 to 4 mm in diameter; the peduncles sparsely pilose, 10 to 40 mm long; rachis pilose; bracts subpedicellate to pedicellate, peltate, 0.5 to 0.75 mm long, disk glabrous above and on the margins, fleshy, obovate to orbicular, 1 to 1.25 mm wide; stamens 2, subsessile, becoming pedicellate after dehiscence, up to 1.5 mm in length, anthers obovoid to oblong, connective above the loculi enlarged, fleshy, rounded, loculi large, bilocular, 2-valved, dehiscence lateral, filaments as long as the anthers, somewhat swollen at the base.

SAMAR, Mount Canislagan, *Bur. Sci. 17602 Ramos* (type collection of *Piper longilimbum* C. DC.); Catubig River, *Bur. Sci. 24307 Ramos.* BOHOL, Bilar, *Bur. Sci. 42752 Ramos.* MINDANAO, Surigao Province, Placer, *Wenzel 3201:* Agusan Province, Waloe, Agusan River, *Merrill 7280:* Davao Province, Mount Mayo, *Bur. Sci. 49461 Ramos and Edaño:* Bukidnon Province, Sumilao, *Bur. Sci. 15773 Fénix* (type collection of *Piper villirache* C. DC.): Zamboanga Province, Malangas, *Bur. Sci. 36853, 36857, 36889, 36989 Ramos and Edaño.* In forests at low and medium altitudes, ascending to 700 meters. Endemic.

Local names: Parong-dagkó (S. L. Bis.); tugpuán (Buk.).

A species close to *Piper celtidiforme* Opiz, differing essentially in its thick branches, hirsute lower surface of the leaves, tubercular fruits, and rounded connective.

Section ZIPPELIA sect. nov.

Blume in Roem. et Schultes, Syst. Veg. 7 (1830) 1614, 1651 (genus).

Leaves oblong-ovate to ovate, base cordate, 5-nerved. Spike solitary, leaf-opposed. Flowers bisexual. Bracts sessile, peltate, base adnate to the rachis, apex cucullate. Fruits glochidiate, pedicellate, remote. Stamens 6.

87. PIPER BEGONIAEFOLIUM (Blume) comb. nov. Text fig. 103.

Zippelia begoniaefolia BLUME in Roem et Schultes, Syst. Veg. 7 (1830) 1614, 1651; MIQ., Syst. Pip. (1843) 548, Nov. Act. Acad. Nat. Cur. 21 (1846) Suppl. 82, *t. 92 f. c.*; MERR., Philip. Journ. Sci. 13 (1918) Bot. 6, Enum. Philip. Fl. Pl. 2 (1923) 18.

Zippelia lappacea BENN. in Pl. Jav. Rar. (1838) 76, *t. 16.*

Piper zippelia C. DC., Prodr. 16[1] (1869) 256, Candollea 1 (1923) 71.

Piper lappaceum C. DC. in Lecomte Fl. Gén. Indo-Chine 5 (1910) 68, Candollea 1 (1923) 71.

Plant fasciculate; the stem erect, suffrutescent, glabrous, 27 to 41 cm high, about 3 mm in diameter, simple and sparingly branched; the branches terete, glabrous, somewhat succulent. Leaves membranaceous, oblong-ovate to ovate, 7 to 13.5 cm long, 4 to 6 cm wide, base subequilaterally cordate, 5-nerved, apex acutely acuminate, brown-punctulate beneath, glabrous on

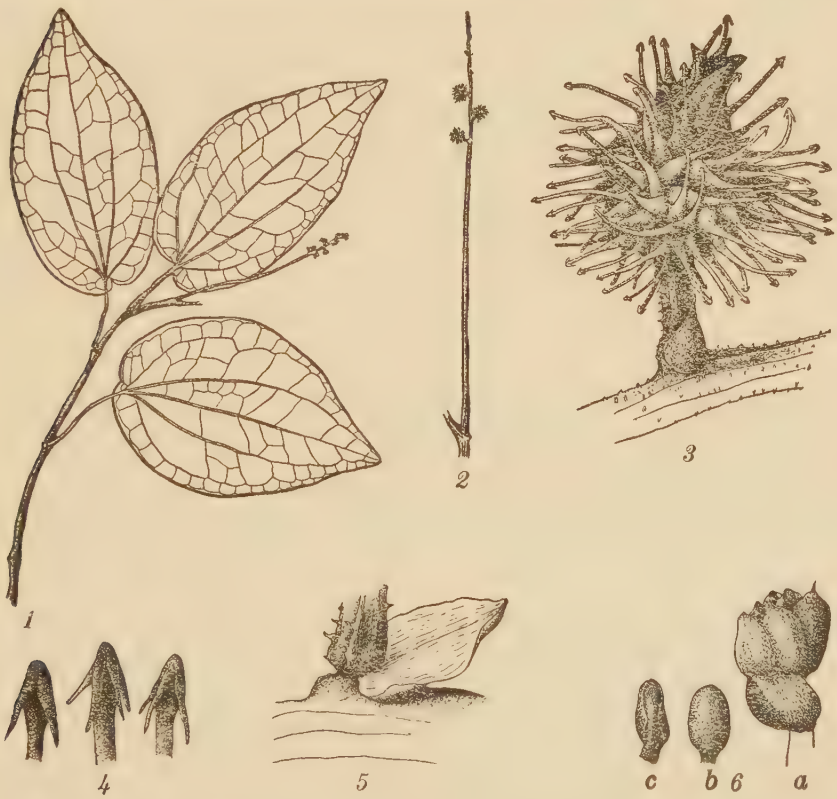

FIG. 103. *Piper begoniaefolium* (Blume) comb. nov.; *1*, fruiting branch, with young spike, × 0.5; *2*, mature spike, × 0.5; *3*, fruit, × 7.5; *4*, tips of bristles, × 40; *5*, bract adnate to the base of the pedicel, × 10; *6*, *a*, stamens and bract, *b*, front view of stamen; *c*, back view of stamen, × 10.

both surfaces; petioles glabrous, 1.6 to 2.7 cm long. Spike erect, solitary, leaf-opposed, 3 to 5 cm long; the peduncles glabrous, 7 to 11.5 cm long; rachis subglabrous to hirtellous, very slender, 0.5 to 0.75 mm in diameter; flowers small, bisexual, remote, inserted above the bracts; bracts sessile, base adnate to the rachis, disk membranaceous, ovate, cucullate, 1.25 to 1.5 mm long, 1 to 1.25 mm wide; ovary subglobose; stigmas 4, coalesced when young, separating at maturity, linear-ovoid; fruits pedicellate, glochidiate, remote, globose, 4 to 6 mm long, 4 to 5.5 mm in diameter including the bristles, the pedicels 1.25 to 2 mm long; stamens 6, anthers oblong to oblong-ovoid, erect, bilocular, dehiscence introrse, filaments very much shorter than the anthers.

JOLO, *Clemens 9335,* in damp forests, altitude about 700 meters. Indo-China and the Malay Peninsula to Sumatra and Borneo. Type from Java.

I do not agree with C. de Candolle in placing this in the section *Ottonia;* first by its morphologic features and secondly on account of its geographic range. None of the species in the section *Ottonia* have glochidiate fruits and 6 stamens. It is hardly conceivable that a group typically Indo-Malaysian will reach as far as Mexico and Brazil. This species has peculiar features not found in other representatives of the genus, notably the glochidiate fruits.

DOUBTFUL AND EXCLUDED SPECIES

PIPER AMBOINENSE C. DC.

Piper amboinense C. DC., Prodr. 16[1] (1869) 347, Candollea 1 (1923) 190; F.-VILL., Novis. App. (1880) 175; MERR., Enum. Philip. Fl. Pl. 2 (1923) 17.

"Hab. Luzon" F.-Villar. An Amboina species erroneously credited by F.-Villar to the Philippines. Amboina and Ternate.

It is very probable that F.-Villar saw a *Piper lessertianum* (Miq.) C. DC.

PIPER ARCUATUM Blume.

Piper arcuatum BLUME in Verh. Bat. Genoots. 11 (1826) 180, *f. 11;* C. DC., Prodr. 16[1] (1869) 360, Candollea 1 (1923) 194; F.-VILL., Novis. App. (1880) 175; MERR., Enum. Philip. Fl. Pl. 2 (1923) 17.

"V. v. sp. in Luzon" F.-Villar. A species erroneously credited by F.-Villar to the Philippines. It has not been found in the Archipelago. Java, Ternate, Ceylon, Amboina, Borneo.

PIPER ATTENUATUM Wall.

Piper attenuatum Wall.; MIQ., Syst. Pip. (1843) 306, Nov. Act. Acad. Nat. Cur. 21 (1846) Suppl. 49, *t. 49;* C. DC., Prodr. 16[1] (1869) 363, Candollea 1 (1923) 219; F.-VILL., Novis. App. (1880) 176; MERR., Enum. Philip. Fl. Pl. 2 (1923) 17.

"V. v. sp. in Luzon" F.-Villar. A species erroneously credited by F.-Villar to the Philippines. It has not been found in the Archipelago. India and Malaya. The specimen seen by F.-Villar was probably a *Piper interruptum* Opiz.

PIPER CALLOSUM Ruiz and Pavon.

Piper callosum RUIZ and Pavon in Fl. Peru 1 (1798) 34, *t. 53, f. a.;* PRESL, Rel. Haenk. 1 (1828) 152; C. DC., Prodr. 16[1] (1869) 260, Candollea 1 (1923) 80; MERR., Enum. Philip. Fl. Pl. 2 (1923) 17.

"Hab. in insula Luzon" Presl; the record was apparently based on a Peruvian specimen erroneously localized as Philippine.

PIPER CALVIFOLIUM C. DC.

Piper calvifolium C. DC. in Philip. Journ. Sci. 11 (1916) Bot. 217, Candollea 1 (1923) 195; MERR., Enum. Philip. Fl. Pl. 2 (1923) 5.

LUZON (*Loher 6794 p. p.*). Endemic.

I have examined the material in the Kew Herbarium and it is *Piper ramosii* C. DC. The other sheet which is deposited in the Munich Herbarium is the type of *Piper calvifolium* C. DC.; of it I have seen only a photograph.

PIPER CLYPEATUM Wall.

Piper clypeatum Wall.; C. DC., Prodr. 16[1] (1869) 378, Candollea 1 (1923) 230; MIQ., Syst. Pip. (1843) 337, p. p.; F.-VILL., Novis. App. (1880) 176; MERR., Enum. Philip. Fl. Pl. 2 (1923) 18.

This species was erroneously credited to the Philippines by F.-Villar; it has not been found in the Archipelago. Penang, Singapore.

PIPER DENUDATUM Opiz.

Piper denudatum OPIZ in Presl Rel. Haenk. 1 (1828) 158; C. DC., Prodr. 16[1] (1869) 377, Philip. Journ. Sci. 5 (1910) Bot. 444, Candollea 1 (1923) 204; F.-VILL., Novis. App. (1880) 176; MERR., Enum. Philip. Fl. Pl. 2 (1923) 8.

Rhyncholepis haenkeana MIQ., Syst. Pip. (1843) 284, Fl. Ind. Bat. 1[2] (1858–59) 449.

I have examined and studied critically the type which was kindly loaned to me by Dr. Malkovsky, of the Prague Herbarium

and I am convinced that there was a mixture. The leaves look like a broad-leafed *Piper toppingii* C. DC. The single pistillate spike was detached from the plant and placed in a pocket. I do not believe the spike belongs to this plant at all. C. de Candolle and Miquel failed to describe the bracts. The spike, which was immature, can safely be a *Piper nigrum* Linn., noting particularly the bracts and type of the fruits. Merrill [9] interpreted this species as a valid one and reduced such species as *P. albidirameum.* I believe his interpretation was erroneous.

PIPER GRANDE Vahl.

Piper grande VAHL in Eclog. Amer. 2 (1798) 3, *t. 11*, Enum. 1 (1804) 321; OPIZ, Presl in Rel. Haenk. 1 (1828) 156; C. DC., Prodr. 16[1] (1869) 370, Candollea 1 (1923) 136; MERR., Enum. Philip. Fl. Pl. 2 (1923) 18.

"Hab. in insula Luzon" Opiz. Vahl's species is an American form and one of doubtful status. Haenke's Luzon specimen was either erroneously localized or wrongly identified.

PIPER GUAHAMENSE C. DC.

Piper guahamense C. DC., Prodr. 16[1] (1869) 336, Philip. Journ. Sci. 9 (1914) 71, Candollea 1 (1923) 173; F.-VILL., Novis. App. (1880) 176; MERR., Enum. Philip. Fl. Pl. 2 (1923) 17.

A species erroneously credited by F.-Villar to the Philippines; it has not been found in the Archipelago. Guam.

PIPER JAGORI C. DC.

Piper jagori C. DC., Prodr. 16[1] (1869) 358 (*jayeri*, sphalm); Philip. Journ. Sci. 5 (1910) Bot. 437, Candollea 1 (1923) 190; F.-VILL., Novis. App. (1880) 175; MERR., Enum. Philip. Fl. Pl. 2 (1923) 10.

LUZON (*Jagor 162*, type in herb. Berlin). Probably from the forests at low altitudes. Endemic. A species of doubtful status. I have not seen the type specimen.

PIPER LATUM H.B.K.

Piper latum H.B.K. in Nov. Gen. (1815–25) 57; OPIZ, Presl in Rel. Haenk. 1 (1828) 159; C. DC., Prodr. 16[1] (1869) 245; MERR., Enum. Philip. Fl. Pl. 2 (1923) 18.

"Hab. ad portum Sorsogon in insula Luzon" Opiz. The record was unquestionably based on an American specimen erroneously localized in the Haenke Malaspina Expedition collection.

[9] Enum. Philip. Fl. Pl. 2 (1923) 8.

PIPER LONGUM Linn.

Piper longum LINN., Sp. Pl. (1753) 29; C. DC. Prodr. 16[1] (1869) 355, Philip. Journ. Sci. 5 (1910) Bot. 423, Candollea 1 (1923) 183; F.-VILL., Novis. App. (1880) 175; MERR., Enum. Philip. Fl. Pl. 2 (1923) 11.

According to C. de Candolle there is in his herbarium a specimen collected in the Philippines with the collector unknown. I have examined his herbarium and have not seen this particular specimen. As this species is cultivated from Ceylon to Malaysia it is possible that it exists as a cultivated plant in some parts of the Philippines, but its status as a Philippine species remains doubtful because it has not appeared in the very extensive collections made in all parts of the Archipelago in the past twenty-eight years.

PIPER MANILLANUM Miq.

Piper manillanum MIQ., Syst. Pip. (1843) 339; C. DC., Prodr. 16[1] (1869) 378; MERR., Enum. Philip. Fl. Pl. 2 (1923) 18.

"Habitat in insula Manila (*Gaudichand 15,* Dec. 1836 in herb. de Less.), in Singapore (Wallich List No. 6655b ex parte)" Miquel. The Philippine specimen was probably from Singapore or Penang rather from the Philippines. C. de Candolle considered this species a synonym of *Piper clypeatum* Wall.

PIPER MARGINATUM Jacq.

Piper marginatum JACQ. in Ic. Pl. Rar. 2 (1781–93) 2, *t. 215;* C. DC., 16[1] (1689) 245, Candollea 1 (1923) 82, 84; F.-VILL., Novis. App. (1880) 176; MERR., Enum. Philip. Fl. Pl. 2 (1923) 17.

"Vidi vivam, cultam ad Manilam, N. vernaculum, *Buyo de Anis*" F.-Villar. A species erroneously credited to the Philippines by F.-Villar. It has not been found in the Archipelago. Tropical America. The specimen seen by F.-Villar was probably a *Piper betle* Linn.

PIPER POTAMOGETONIFOLIUM Opiz.

Piper potamogetonifolium OPIZ in Presl Rel. Haenk. 1 (1828) 156; C. DC., Prodr. 16[1] (1869) 376, Candollea 1 (1923) 230; F.-VILL., Novis. App. (1880) 176; MERR., Philip. Journ. Sci. 9 (1914) Bot. 72, Enum. Philip. Fl. Pl. 2 (1923) 17.

A species originally described from Guam, as yet not found in the Philippines. It is one of the species erroneously credited to the Philippines by F.-Villar.

PIPER RADICANS Vahl.

Piper radicans VAHL, Enum. 1 (1804) 333; OPIZ in Presl Rel. Haenk. 1 (1828) 159; C. DC., Prodr. 16[1] (1869) 379, Candollea 1 (1923) 321; F.-VILL., Novis. App. (1880) 176; MERR., Enum. Philip. Fl. Pl. 2 (1923) 18.

Merrill's interpretation of the species is probably correct: "Vahl's type was from the Isle of France; Opiz was doubtless in error in referring Haenke's Luzon specimen to this species."

PIPER RUFINERVE Opiz.

Piper rufinerve OPIZ in Presl Rel. Haenk. 1 (1828) 159; MIQ., Syst. Pip. (1843) 366; C. DC., Prodr. 16[1] (1869) 377, Philip. Journ. Sci. 5 (1910) Bot. 462; F.-VILL., Novis. App. (1880) 176; MERR., Enum. Philip. Fl. Pl. 2 (1923) 15.

"Habitat in insula Luzon" Haenke. A species of doubtful status, known only from the original description.

PIPER SYLVESTRE Lam.

Piper sylvestre LAM., Ill. 1 (1791) 79; VAHL, Enum. 1 (1804) 326; C. DC., Prodr. 16[1] (1869) 361, Candollea 1 (1923) 215 (*silvestre*); F.-VILL., Novis. App. (1880) 175; MERR., Enum. Philip. Fl. Pl. 2 (1923) 18.

"V. v. sp. in Luzon," F.-Villar. Lamarck's type material was from "Insula Franciae, Malabaria, Philippines." As currently interpreted this is an Indian species.

PIPER TAUMANUM C. DC.

Piper taumanum C. DC. in Perk. Frag. Fl. Philip. (1905) 159, Philip. Journ. Sci. 5 (1910) Bot. 462, Candollea 1 (1923) 281; MERR., Enum. Philip. Fl. Pl. 2 (1923) 15.

MINDANAO, Davao Province, *Warburg 14741*.

This species is of doubtful status, having been described from a sterile and apparently juvenile specimen.

Genus PEPEROMIA Ruiz and Pavon

Key to the species of Peperomia.

1. Leaves alternate.
   2. Lamina subpellucid to pellucid, glabrous on both surfaces.
      3. Stems procumbent; fruits verruculose, never striate-costulate.
         4. Spikes axillary and terminal, filiform; lamina (3 to 8 by 4.5 to 10 mm); petioles up to 4 mm long..... 15. *P. exigua.*
         4. Spikes leaf-opposed and terminal, fleshy; lamina (10 to 18 by 10 to 19 mm); petioles up to 16 mm long..... 20. *P. lanaoensis.*
      3. Stems erect.
         4. Fruits striate-costulate; spikes filiform..... 14. *P. pellucida.*
         4. Fruits verruculose, never striate-costulate; spikes fleshly. 10. *P. merrillii.*

2. Lamina opaque.
3. Lamina glabrous on both surfaces, margins and apex glabrous; spikes subfleshy to fleshly, elongated, 3.5 to 6.8 cm long.
4. Lamina nerved; spikes loosely flowered; fruits brown.
5. Spikes subfleshy; bracts orbicular; fruits sparingly verruculose. 8. *P. pellucidopunctulata.*
5. Spikes fleshy; bracts suborbicular; fruits verruculose. 7. *P. laevifolia.*
4. Lamina plinerved; spikes densely flowered; fruits black and verruculose ..... 9. *P. agusanensis.*
3. Lamina glabrous on both surfaces, margins and apex ciliate, ovate-lanceolate to elliptic-lanceolate; spikes filiform, short, 8 to 15 mm long; stigma single, entire ..... 11. *P. negrosensis.*
3. Lamina glabrous above, pubescent beneath, elliptic-lanceolate; spikes filiform, moderately long, 20 to 35 mm long; stigma penicillate. 13. *P. elmeri.*
3. Lamina pubescent on both surfaces, oblong-elliptic to rounded-elliptic; spikes subfiliform, long, 25 to 45 mm long; stigma single, entire ..... 21 *P. rivulorum.*

1. Leaves opposite or verticillate.
2. Rachis glabrous.
3. Plant and leaves dark-colored; spikes densely flowered; lamina densely pubescent on both surfaces ..... 4. *P. copelandii.*
3. Plant and leaves not dark-colored.
4. Spikes filiform or subfleshy.
5. Stem prostrate or procumbent.
6. Lamina membranaceous, elliptic-lanceolate (13 to 25 by 7 to 10 mm), apex and base acute; spikes up to 4 cm long. 12. *P. mindorensis.*
6. Lamina thin, membranaceous, oblong to obovate (4 to 8 by 3 to 6 mm), base subacute, apex obtuse to rounded; spikes up to 2 cm long ..... 3. *P. canlaonensis.*
5. Stem erect or decumbent at the base.
6. Sparsely and dichotomously branched.
7. Lamina more or less pubescent on both surfaces, membranaceous, oblong-elliptic to obovate; spikes up to 5 cm long. 2. *P. pallidibacca.*
7. Lamina glabrous on both surfaces, membranaceous, elliptic-ovate; spikes up to 4.5 cm long. 6. *P. lagunaensis.*
6. Profusely branched, branches opposite, densely hirtellous; lamina densely pubescent on both surfaces, membranaceous to chartaceous, usually elliptic-obovate.
7. Spikes up to 5 cm long ..... 5. *P. recurvata* var. *pilosior.*
7. Spikes up to 10.5 cm long .... 5. *P. recurvata* var. *longispica.*
4. Spikes fleshy.
5. Lamina more or less pubescent on both surfaces, obovate to rounded-ovate, 14 to 25 by 11 to 20 mm; spikes up to 9.5 cm long; stigma a little below the apex, globose. 19. *P. rubrivenosa.*

5. Lamina densely pubescent on both surfaces.
   6. Bracts subsessile, up to 0.5 mm wide; spikes up to 5.5 cm long.
      7. Lamina usually elliptic-ovate, sometimes rounded-elliptic-ovate (usually 12 to 20 by 10 to 15 mm); stigma terminal, entire, globose ..... 16. *P. marivelesana.*
      7. Lamina subrhomboid-elliptic to subobovate-elliptic (11 to 23 by 5 to 11 mm); stigma a little below the apex, penicillate ..... 17. *P. tomentosa* var. *carnosa.*
   6. Bracts pedicellate, up to 1.25 mm wide; lamina subobovate-elliptic or oblanceolate (20 to 40 by 12 to 18 mm); spikes up to 7 cm long..... 18. *P. latibracteata.*
2. Rachis pubescent.
   3. Lamina glabrous on both surfaces, chartaceous to subcoriaceous when dry; profusely branched; spikes fleshy, up to 35 mm long. 1. *P. reflexa* var. *capensis.*
   3. Lamina puberulent above, glabrous beneath, chartaceous; sparingly branched; spikes subfleshy, up to 10 mm long. 1. *P. reflexa* var. *parvilimba.*

1. PEPEROMIA REFLEXA (Linn. f.) A. Dietr. var. CAPENSIS (Miq.) C. DC. Text fig. 104.

Peperomia reflexa (Linn. f.) A. Dietr. var. *capensis* (Miq.) C. DC., Prodr. 16[1] (1869) 451.

Peperomia reflexa A. Dietr. forma *capensis* MIQ., Syst. Pip. (1843) 169; C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 410; MERR., Enum. Philip. Fl. Pl. 2 (1923) 20.

Peperomia reflexa A. Dietr. forma *subsessilifolia* C. DC., Prodr. 16[1] (1869) 452, Philip. Journ. Sci. 5 (1910) Bot. 410; MERR., Enum. Philip. Fl. Pl. 2 (1923) 20.

Peperomia reflexa A. Dietr. var. *calcicola* C. DC., in Philip. Journ. Sci. 5 (1910) Bot. 410, Candollea 1 (1923) 301; MERR., Enum. Philip. Fl. Pl. 2 (1923) 20.

Stems several, decumbent and rooting below, angular-sulcate, shining, glabrous or very sparingly and obscurely pubescent above or sometimes at the nodes, 7 to 23 cm long, 1.25 to 2 mm in diameter, profusely branched, branching dichotomously or rarely trichotomously, the branches angular-sulcate, shining glabrous or very sparingly and obscurely pubescent. Leaves verticillate (ternate or quaternate), sometimes opposite below, oblong-subelliptic, obovate, ovate-elliptic or rounded-elliptic, 7 to 15 mm long, 5 to 10.5 mm wide, base subacute to acute, obscurely 3-nerved, apex obtuse to rounded, chartaceous to subcoriaceous when dry, thick and fleshy when living, opaque, glabrous and shining on both surfaces, pellucido-punctulate or fusco-punctulate on both surfaces, not reticulate; petioles hirtellous, very slender, 1 to 2 mm long. Spike erect, always solitary and terminal, subfleshy to fleshy, densely flowered, usually 10 to 20 mm long, sometimes up to 35 mm in length; peduncles

FIG. 104. *Peperomia reflexa* (Linn. f.) A. Dietr. var. *capensis* (Miq.) C. DC.; *1*, habit sketch of the plant, × 0.5; *2*, portion of the spike, × 7.5; *3*, top and side views of bracts, × 10; *4*, fruits, × 10; *5*, detail of the apex of a fruit, × 40; *6*, stamens, × 40; var. *parvilimba* C. DC.; *7*, habit sketch of the plant, × 0.5.

hirtellous, slender, 10 to 21 mm long; rachis densely hirtellous, 1.5 to 2 mm in diameter; bracts subpedicellate, peltate, disk glabrous, membranaceous, orbicular, about 0.5 mm wide; stigma terminal or oblique, single, capitellate, puberulate-glandular; ovaries deeply immersed in deep pits, oblong, brown, smooth; fruits immersed in deep pits, oblong-cylindric, 0.8 to 1 mm long, 0.4 to 0.45 mm in diameter, acuminate, brown, smooth; stamens not numerous, deciduous after maturity, anthers ellipsoid, filaments longer than the anthers.

LUZON, Lepanto Subprovince, Mount Data, *Merrill 4583:* Benguet Subprovince, Baguio, *Elmer 6077* (type collection of *Peperomia reflexa* A. Dietr. var. *calcicola* C. DC.), *8576, Bur. Sci. 3480 Mearns, Sandkuhl 199, Williams 1114;* Mount Santo Tomas, *Bur. Sci. 5404 Ramos, For. Bur. 5066 Curran, 11105 Whitford, Philip. Pl. 748 Merrill;* Mount Pauai, *Bur. Sci. 8461*

McGregor; Mount Lusong, *Bur. Sci. 40442 Ramos and Edaño;* Mount Pulog, *Bur. Sci. 8894 McGregor, For. Bur. 16239 Curran, Merritt, and Zschokke.* MINDANAO, Bukidnon Province, Mount Candoon, *Bur. Sci. 38813 Ramos and Edaño:* Davao Province, Mount Apo, *Copeland s. n.* 1904. On trees, bowlders, and ledges at higher altitudes. In various forms and varieties in the Tropics of both hemispheres.

After critical study of all the Philippine specimens in the herbaria of the Bureau of Science, University of California, United States National Museum, and Kew, I find no justification in retaining var. *calcicola* C. DC. originally described from the Philippines. It differs from var. *capensis* only by the thickness of its leaves, which is apparently due to environmental conditions. I am also of the opinion that the Philippine specimens called *subsessilifolia* by C. de Candolle do not differ from *capensis.* Despite the variability of this species, I have only two cases in which the lower surface of the leaves are pubescent.

This remarkable species, very clearly distinct from any known *Peperomia* in the Philippines, is characterized by its pubescent rachis, and is readily recognized by its habit and foliage, its oblong-cylindric, smooth fruits which are immersed in deep pits, and its capitellate and puberulate-glandular stigma.

Var. PARVILIMBA C. DC.

Peperomia reflexa (Linn. f.) A. Dietr. var. *parvilimba* C. DC. in Candollea 1 (1923) 406, Philip. Journ. Sci. 5 (1910) Bot. 410 (forma *parvilimba* C. DC); MERR., Enum. Philip. Fl. Pl. 2 (1923) 20.

Stem habit like *capensis,* glabrous, 4 to 6 cm high, 0.5 to 1 mm in diameter, very sparingly branched. Leaves ovate-elliptic to rounded-ovate, 4 to 7 mm long, 3 to 6.5 mm wide, base acute, obscurely 3-nerved, apex obtuse to rounded, chartaceous when dry, opaque, hirtellous above, glabrous beneath, apex and margins ciliate; petioles hirtellous, very slender, 0.75 to 1.5 mm long. Spike erect, solitary and terminal, subfleshy, densely flowered, 6 to 12 mm long; peduncles hirtellous, slender, 7 to 10 mm long; rachis densely hirtellous, somewhat fleshy, 1.25 to 1.5 mm in diameter; bracts, ovaries, stigmas, fruits, and stamens as in *capensis,* but somewhat smaller.

LUZON, Pampanga Province, Mount Arayat, *Merrill 3918* [type collection of *Peperomia reflexa* (Linn. f.) A. Dietr. var. *parvilimba* C. DC.], *Bolster 97.* On rocks near the summit. Endemic.

This variety, admirably represented by copious material of two collections, approaches most nearly var. *capensis* but is a

considerably smaller plant, with smaller leaves, which are pubescent on the upper surface. The spikes and peduncles are relatively shorter.

2. PEPEROMIA PALLIDIBACCA C. DC. Text fig. 105.

Peperomia pallidibacca C. DC. in Leafl. Philip. Bot. 3 (1910) 763, Philip. Journ. Sci. 5 (1910) Bot. 413, Candollea 1 (1923) 335; MERR., Enum. Philip. Fl. Pl. 2 (1923) 20.

Peperomia ramosii C. DC. in Candollea 1 (1923) 315 *nomen nudum*, 2 (1925) 188.

Stem erect with decumbent base, pale, glabrous to densely hirtellous, rather slender, rooting at the nodes, dichotomously branched, the branches subglabrous to densely hirtellous at the

FIG. 105. *Peperomia pallidibacca* C. DC.; *1*, habit sketch of the plant, × 0.5; *2*, form of leaves, × 0.5; *3*, base of an immature spike, × 10; *4*, top and side views of bracts, × 10; *5*, fruits, × 10; *6*, stamens, × 40.

apices. Leaves opposite or ternate, oblong-elliptic to obovate, 10 to 20 mm long, 4 to 10 mm wide, rarely up to 25 mm in length, base cuneate, obscurely 3-nerved, apex subacute to rounded, pale, membranaceous, opaque, subglabrous on both surfaces, or glabrous above and puberulent beneath or hirtellous on both surfaces, apex ciliate, minutely pellucido-punctulate above, fusco-punctulate beneath; petioles hirtellous, very slender, 2 to 5 mm long. Spikes solitary to 5-nate, usually terminal, rarely axillary, filiform, subdensely flowered, pale, 2 to 5 cm

long; the peduncles subglabrous to hirtellous, 5 to 14 mm long; rachis glabrous, very slender, 0.75 to 1 mm in diameter; bracts subsessile, peltate, disk luteo-punctulate, orbicular, about 0.5 mm wide; ovaries immersed in pits, oblong-obovoid; stigma terminal, entire, glabrous; fruits with the bases partly immersed in pits, verruculose, oblong-obovoid, 0.75 to 0.8 mm long, 0.5 to 0.65 mm in diameter, light brown to brown; stamens subsessile, anthers ellipsoid.

LUZON, Bontoc Subprovince, Pinggat, *Vanoverbergh 488:* Benguet Subprovince, Mount Tonglon, *Merrill 7709;* Baguio, *Elmer 9344* (type collection of *Peperomia pallidibacca* C. DC.), *Pond s. n.* 1904: Rizal Province, San Isidro, *Bur. Sci. 12113 Ramos* (type collection of *Peperomia ramosii* C. DC.); Mount Lumutan, *Bur. Sci. 29619 Ramos and Edaño;* Montalban, *Loher 13137;* without definite locality, *Loher s. n.* 1913. At higher altitudes. Endemic.

This species is, I believe, allied to *Peperomia ventenatii* Miq. of Java, from which it is at once distinguished by its longer spikes, its orbicular bracts, oblong-obovoid fruits, and glabrous stigma.

3. PEPEROMIA CANLAONENSIS C. DC. Text fig. 106.

Peperomia canlaonensis C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 408, Candollea 1 (1923) 315; MERR., Enum. Philip. Fl. Pl. 2 (1923) 18.

Stem prostrate, pale, pilose, slender, about 1 mm in diameter, rooting at the nodes, branching from the creeping stem, occasionally branching above, the branches pilose, very slender, 0.5 to 1 mm in diameter. Leaves usually opposite or ternate, or quaternate above, oblong to obovate, usually 4 to 8 mm long, 3 to 6 mm wide, very rarely up to 11 mm in length, base subacute, 1-nerved, apex obtuse to rounded, thin, membranaceous, opaque, sparsely pilose on both surfaces, densely pubescent on the midrib beneath, apex ciliate, margins glabrous, reticulations obsolete; petioles pilose, very slender, 2 to 4 mm long. Spike erect, solitary, terminal, filiform, subdensely flowered, usually 1 to 2 cm long, brown; peduncles pilose, very slender, 10 to 20 mm long; rachis glabrous, very slender, 0.75 to 1 mm in diameter; bracts subsessile, peltate, disk orbicular, about 0.5 mm wide; ovaries immersed, ovoid; stigma terminal, penicillate; fruits verruculose, brown, subglobose, 0.8 to 1 mm long, 0.6 to 0.75 mm in diameter, apex mucronulate, stamens pedicellate, anthers ellipsoid, filaments longer than the anthers.

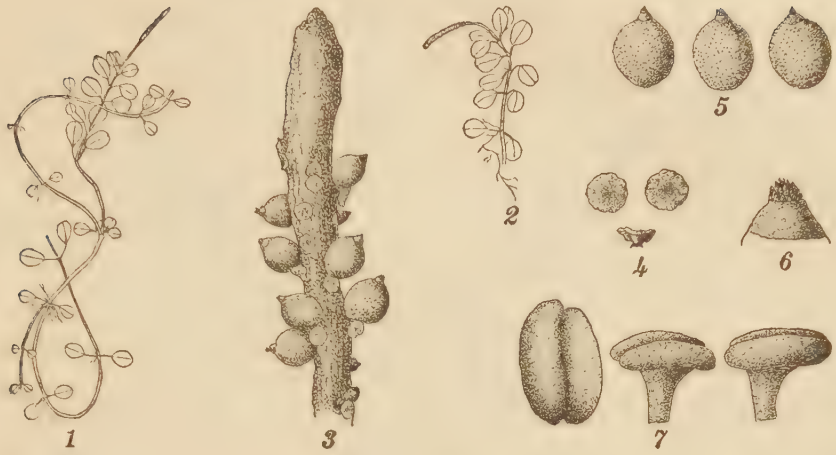

FIG. 106. *Peperomia canlaonensis* C. DC.; *1*, habit sketch of the plant, × 0.5; *2*, fruiting branch, × 0.5; *3*, portion of the spike, × 7.5; *4*, top and side views of bracts, × 10; *5*, fruits, × 10; *6*, apex of a fruit, × 40; *7*, stamens, top and side views, × 40.

NEGROS, Mount Canlaon, *Philip. Pl. 251 Merrill* (type collection of *Peperomia canlaonensis* C. DC.), on trees in the mossy forest, altitude about 1,800 meters. Endemic.

A species manifestly allied to *Peperomia ventenatii* Miq., but with distinctly smaller, solitary spikes, mucronulate fruits, and penicillate stigmas.

4. PEPEROMIA COPELANDII sp. nov. Text fig. 107.

Herba erecta vel procumbente, dense pubescente, nigrescente. Foliis oppositis, rotundato-obovatis, 7 ad 15 mm longis, 6.5 ad 8 mm latis, basi acutis, 1-nerviis, apice obtusis ad rotundatis, nigrescentibus, chartaceis, utrinque dense hirtellis; petiolis dense hirtellis, 1.5 ad 2 mm longis. Spicis erectis, solitariis vel binis, terminalibus, subfiliformibus, densifloris, 3 ad 3.5 cm longis; pedunculis hirtellis, 6 ad 8 mm longis; rachis glabris, 1 ad 1.25 mm diametro; bracteis subsessilibus, peltatis, peltis orbicularis, circiter 0.5 mm latis; ovario immerso, oblongo-obovoideo; stigmatibus punctiformis, obliquis, glabris; baccis immersis, oblongo-ovoideis, verruculosis, nigrescentibus, circiter 0.6 mm longis, 0.5 mm diametro, apice subacutis; staminibus pedicellatis, antheris ellipsoideo-subovoideis.

Stem erect or procumbent, dark-colored, densely hirtellous, somewhat slender, 6.5 to 7.5 cm high including the spikes, rooting below, branching very sparingly at the base; the branches hirtellous. Leaves opposite or ternate above, chartaceous,

FIG. 107. *Peperomia copelandii* sp. nov.; *1*, habit sketch of the plant, × 1; *2*, top and side views of the bracts, × 20; *3*, fruits in different views, × 20; *4*, top and side views of stamens, × 80.

rounded-obovate, 7 to 15 mm long, 6.5 to 8 mm wide, base acute, 1-nerved, apex obtuse to rounded, dark-colored, opaque, densely hirtellous on both surfaces, margins and apex densely ciliate; petioles densely hirtellous, very slender, 1.5 to 2 mm long, in the lower leaves slightly longer, up to 3.5 mm in length. Spike erect, solitary or binate, terminal, subfiliform, densely flowered,

dark-colored, 3 to 3.5 cm long; the peduncles hirtellous, slender, 6 to 8 mm long; rachis glabrous, slender, 1 to 1.25 mm in diameter; bracts subsessile, peltate, disk orbicular, about 0.5 mm wide; ovaries immersed, oblong-obovoid; stigma entire, punctiform, oblique, glabrous; fruits oblong-ovoid, verruculose, black, about 0.6 mm long, 0.5 mm in diameter, apex subacute; stamens pedicellate, anthers ellipsoid-subovoid, filaments about as long as the anthers.

LUZON, Benguet Subprovince, Mount Pauai, *Copeland 178* (type in herb. Manila), May 1913, at higher altitudes.

This species is clearly a near relative of *Peperomia ventenatii* Miq., but differs in being dark-colored and its leaves being densely pubescent on both surfaces, and its glabrous, punctiform, oblique stigmas.

5. PEPEROMIA RECURVATA (Blume) Miq. var. PILOSIOR C. DC. Text fig. 108, 1-6.

Peperomia recurvata (Blume) Miq. var. *pilosior* C. DC. in Candollea 1 (1923) 406, Philip. Journ. Sci. 5 (1910) Bot. 409 (forma *pilosior* C. DC.); MERR., Enum. Philip. Fl. Pl. 2 (1923) 20.

Stem erect, with decumbent base, densely hirtellous, fleshy, 15 to 20 cm high, 2 to 5 mm in diameter below, internodes below as short as 3 mm, lower ones rooting, profusely branched, the branches densely hirtellous, opposite, up to 2 mm in diameter. Leaves opposite or ternate, elliptic-ovate to elliptic-obovate, 15 to 32 mm long, 10 to 20 mm wide, base acute, 3-nerved, apex subacute to obtuse, membranaceous to chartaceous, opaque, densely hirtellous on both surfaces, apex and margins densely ciliate; petioles densely hirtellous, slender, 3 to 5 mm long. Spikes erect, terminal and axillary, usually binate to quaternate, very rarely solitary, filiform, densely flowered, 3 to 5 cm long; the peduncles densely hirtellous, 5 to 10 mm long; rachis glabrous, 0.75 to 1 mm in diameter; bracts subsessile, peltate, disk membranaceous, suborbicular to orbicular, 0.5 to 0.75 mm wide, glabrous; ovaries immersed, obovoid; stigma terminal, entire, glabrous; fruits subverruculose, brown, ovoid, about 0.75 mm long, 0.6 mm in diameter; stamens pedicellate, anthers minutely glandular, ellipsoid, filaments slightly shorter or as long as the anthers.

LUZON, Lepanto Subprovince, Banaao, *Vanoverbergh 603:* Benguet Subprovince, Baguio, *Elmer 6622* [type of *Peperomia recurvata* (Blume) Miq. var. *pilosior* C. DC. in herb. Manila], *Bur. Sci. 3501 Mearns.* On rocks at higher altitudes. Endemic.

FIG. 108. *Peperomia recurvata* (Blume) Miq. var. *pilosior* C. DC.; *1*, habit sketch of the plant, × 0.5; *2*, stem, × 1.5; *3*, apex of a leaf, × 1; *4*, top view of bracts, × 10; *5*, fruit, × 10; *6*, side and top views of stamens, × 40; var. *longispica* C. DC.; *7*, habit sketch of the plant, × 0.5; *8*, fruit, × 10.

5. PEPEROMIA RECURVATA (Blume) Miq. var LONGISPICA C. DC. Text fig. 108, 7-8.

Peperomia recurvata (Blume) Miq. var. *longispica* C. DC. in Candollea 1 (1923) 321, Philip. Journ. Sci. 5 (1910) Bot. 409 (forma *longispica* C. DC.); MERR., Enum. Philip. Fl. Pl. 2 (1923) 20.

Peperomia vanoverberghii C. DC. in Candollea 1 (1923) 321 *nomen nudum*, 2 (1925) 188.

Stem erect, with decumbent base, rarely prostrate, densely hirtellous, fleshy, 18 to 35 cm high, internodes a little longer than in var. *pilosior*, rooting below, profusely branched, the branches densely hirtellous, opposite or alternate, longer than in var. *pilosior*. Leaves opposite or ternate, elliptic-ovate to elliptic-obovate, 18 to 30 cm long, 9 to 17 mm wide, rarely up to 45 cm long and 27 mm wide, base acute, 3-nerved, apex acute to obtuse, membranaceous to chartaceous, opaque, densely hirtellous on both surfaces, apex and margins densely ciliate; petioles densely hirtellous, 3 to 8 mm long, rarely up to 12 mm in length. Spikes erect, spreading, solitary to quaternate, terminal and axillary, filiform, loosely flowered, 4.5 to 10.5 cm long; the peduncles densely hirtellous, 5 to 13 mm long; rachis glabrous, very slender, 0.5 to 1 mm in diameter; bracts subsessile, peltate, disk glabrous, suborbicular to orbicular, 0.5 to 0.75 mm wide; ovaries immersed, obovoid; stigma terminal, entire, glabrous; fruits oblong to ovoid-globose, about 0.75 mm long, 0.6 mm in diameter, verruculose, brown; stamens pedicellate, anthers minutely glandular, ellipsoid, filaments as long as the anthers.

LUZON, Lepanto Subprovince, Bauko, *Vanoverbergh 835, 1363;* without definite locality, *Vanoverbergh 603bis* (type of *Peperomia vanoverberghii* C. DC. in herb. de Candolle; isotype in herb. Manila) : Benguet Subprovince, Kabayan, *Merrill 4425* [type collection of *Peperomia recurvata* (Blume) Miq. var. *longispica* C. DC.]; Mount Pauai, *Bur. Sci. 31715 Santos;* Baguio, *Williams 1084, For. Bur. 4847 Curran, Merrill 7682.* On wet rocky banks and on trees at higher altitudes. Endemic.

Local name: N̄galon (Ig.).

The type locality of the species is Mount Gédé, Java. The two varieties are apparently endemic to the Philippines. They seem to stand near *Peperomia dindygulensis* Miq. forma *macilenta* Miq., differing in their shorter internodes and densely flowered spikes (var. *pilosior*) and their glabrous stigma. The striking features of these varieties are the short internodes at the base of the stem and the numerous opposite branches.

The variety *longispica* is much closer to *Peperomia dindygulensis* Miq. forma *macilenta* Miq. than variety *pilosior*. It differs from var. *pilosior* by its longer and loosely flowered spikes.

6. PEPEROMIA LAGUNAENSIS C. DC. Text fig. 109.

Peperomia lagunaensis C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 407, Candollea 1 (1923) 319; MERR., Enum. Philip. Fl. Pl. 2 (1923) 19.

Peperomia puberulifolia C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 407, Candollea 1 (1923) 334; MERR., Enum. Philip. Fl. Pl. 2 (1923) 19.

A species with much the habit of *Peperomia pellucida* (Linn.) HBK., the stems erect, sometimes with decumbent base, usually 13 to 20 cm high, sometimes up to 36 cm high, subglabrous to sparsely puberulent, somewhat fleshy, 1.5 to 2 mm in diameter, rooting at the nodes below, dichotomously branched, the branches subglabrous to sparsely puberulent. Leaves opposite, very rarely alternate, rarely ternate above, usually elliptic-ovate, sometimes oblong-elliptic or elliptic-obovate, 1.5 to 3.5 cm long, 1 to 1.8 cm wide, base acute, 3-nerved, apex acute, pale when dry, membranaceous, opaque, glabrous on both surfaces, apex ciliate, margins glabrous to ciliate; petioles glabrous, slender, 3 to 6 mm long, up to 8 mm in length. Spike erect, solitary or binate, rarely ternate, terminal and axillary, filiform, subdensely flowered, 2 to 4.5 cm long; the peduncles glabrous, very slender, 7 to 13 mm long; rachis glabrous, very slender, 0.75 to 1 mm in diameter; bracts subsessile, peltate, disk membranaceous, subpellucid, orbicular, about 0.5 mm wide; ovaries immersed, obovoid; stigma terminal, minute, entire, glabrous; fruits ovoid-globose to globose, 0.75 to 0.8 mm long, 0.6 to 0.75 mm in diameter, verruculose, brown, apex acute; stamens pedicellate, anthers ellipsoid, filaments longer than the anthers.

LUZON, Bataan Province, Mount Mariveles, *Merrill 7616, Whitford 114:* Laguna Province, Mount Maquiling, *Merrill 5130* (type collection of *Peperomia lagunaensis* C. DC.), *Elmer 17633, Bur. Sci. 17310 Robinson and Brown;* Mount Banahao, *Bur. Sci. 2446 Foxworthy, 6047* (type of *Peperomia puberulifolia* C. DC. in herb. Manila), *6079, 9760, 9776, 9809 Robinson, 27936 Ocampo, Quisumbing 1281, 1335, Juliano 1083.* In damp forests on mossy earth, bowlders, and tree trunks at medium and higher altitudes, ascending to 1,700 meters. Endemic.

In some respects this species would seem to stand near *Peperomia pellucidopunctulata* C. DC., however, it has usually smaller

FIG. 109. *Peperomia lagunaensis* C. DC.; *1*, habit sketch of the plant, × 0.5; *2*, fruiting branch, × 0.5; *3*, form of leaves, × 0.5; *4*, top and side views of bracts, × 10; *5*, fruits, × 10; *6*, stamens, × 40.

opposite leaves, sometimes ternate above, which are ciliate at the apex, filiform and shorter spikes, and pedicellate stamens.

7. PEPEROMIA LAEVIFOLIA (Blume) Miq. Text fig. 110.

Peperomia laevifolia (Blume) MIQ., Syst. Pip. (1843) 107; C. DC., Prodr. 16[1] (1869) 419, Candollea 1 (1923) 350, 356 *levifolia*.

Piper laevifolium BLUME in Cat. Gew. Buitenz. (1823) 33, Verh. Bat. Genoots. 11 (1826) 229.

Micropiper laevifolium MIQ., in Comment. Phyt. (1840) 56, *t. 9, f. E*.

Peperomia apoana C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 411, Candollea 1 (1923) 347; MERR., Enum. Philip. Fl. Pl. 2 (1923) 18.

Stem erect, the base sometimes decumbent, glabrous, terete, 15 to 25 cm high, rooting below, dichotomously branched, the branches glabrous, terete, internodes rather short. Leaves alternate, oblong-elliptic to ovate, the lower ones obovate, 2.3 to

FIG. 110. *Peperomia laevifolia* (Blume) Miq.; *1*, habit sketch of the plant, × 0.5; *2*, fruiting branch, × 0.5; *3*, form of leaves, × 0.5; *4*, side view of ovary and bract, × 40; *5*, top view of bract, × 40; *6*, fruits, × 10; *7*, stamens, × 40.

4.2 cm long, 1 to 2.4 cm wide, base cuneate, 3-nerved to obscurely 5-nerved, apex acute to acutely subacuminate, membranaceous, opaque, somewhat rigid, glabrous on both surfaces, usually dark above, paler beneath, reticulations obsolete; petioles glabrous, 4 to 8 mm long, up to 15 mm in length. Spikes solitary to ternate, axillary and terminal, fleshy, loosely flowered, 3.5 to 4.5 cm long, up to 6 cm in length; the peduncles glabrous, usually 8 to 10 mm long, sometimes up to 20 mm in length; rachis glabrous, fleshy, 1.5 to 2 mm in diameter; bracts subpedicellate, peltate, disk glabrous, suborbicular, 0.4 to 0.6 mm wide; ovaries immersed, glabrous, ovoid; stigma terminal, entire, inconspicuous; fruits subglobose, 0.6 to 0.75 mm long, 0.5 to 0.6 mm in diameter, verruculose, brown; stamens subpedicellate, anthers ellipsoid, filaments about as long as the anthers.

PANAY, Antique Province, near Culasi, *Bur. Sci. 32441 McGregor.* NEGROS, Negros Oriental Province, Dumaguete, Cuernos Mountains, *Elmer 9970.* MINDANAO, Bukidnon Province, Mount Lipa, *Bur. Sci. 38560 Ramos and Edaño:* Davao Province, Mount Apo, *Copeland 1002* (type collection of *Peperomia apoana* C. DC.) : Zamboanga Province, Sax River Mountains, *Merrill 8158.* In forests at higher altitudes, ascending to 2,200 meters. Java.

Peperomia apoana C. DC. is certainly identical with *Peperomia laevifolia* (Blume) Miq., the type of which is from Java. This species differs from *Peperomia pellucidopunctulata* C. DC. conspicuously by being dichotomously branched, as well as in its suborbicular bracts, its verruculose fruits, and its numerous terminal spikes.

8. PEPEROMIA PELLUCIDOPUNCTULATA C. DC. Text fig. 111.

Peperomia pellucidopunctulata C. DC. in Leafl. Philip. Bot. 3 (1910) 760, Philip. Journ. Sci. 5 (1910) Bot. 411, Candollea 1 (1923) 349; MERR., Enum. Philip. Fl. Pl. 2 (1923) 20.

Stem erect, glabrous, subterete, 20 to 36 cm high, rooting at the base, usually branching sparingly from the base, the branches glabrous, subterete. Leaves alternate, oblong-elliptic to elliptic-lanceolate, 2.5 to 4.5 cm long, 1.4 to 2.2 cm wide, base acute, 5-nerved, apex acute to acutely acuminate, chartaceous, opaque, glabrous on both surfaces, margins and apex glabrous; petioles glabrous, 4.5 to 8 mm, sometimes up to 15 mm long. Spike usually solitary, very rarely binate, axillary and terminal, subfleshy, loosely flowered, 4.5 to 6.8 cm long; the peduncles glabrous, slender, 6 to 12 mm long; rachis glabrous, 1 to 1.5 mm in diameter; bracts subpedicellate, peltate, disk glabrous, orbicular, 0.4 to 0.5 mm wide; ovaries immersed, ovoid; stigma terminal, entire, more or less inconspicuous; fruits ovoid, 0.7 to 0.8 mm long, 0.5 to 0.6 mm in diameter, brown, sparingly verruculose; stamens subsessile, anthers ellipsoid.

LUZON, Benguet Subprovince, Baguio, *Elmer 8436* (type collection) : Albay Province, Mount Mayon, *Bur. Sci. 2962 Mearns, 6469 Robinson.* On rocks and tree trunks at medium and high altitudes. Endemic.

A species in some respects resembling *Peperomia merrillii* C. DC., but differing in its longer, subfleshy, loosely flowered spikes and its vegetative characters. The leaves are elliptic, opaque, densely pellucido-punctulate, and the first inner nerves fading out above the middle. The fruits are sparingly verruculose.

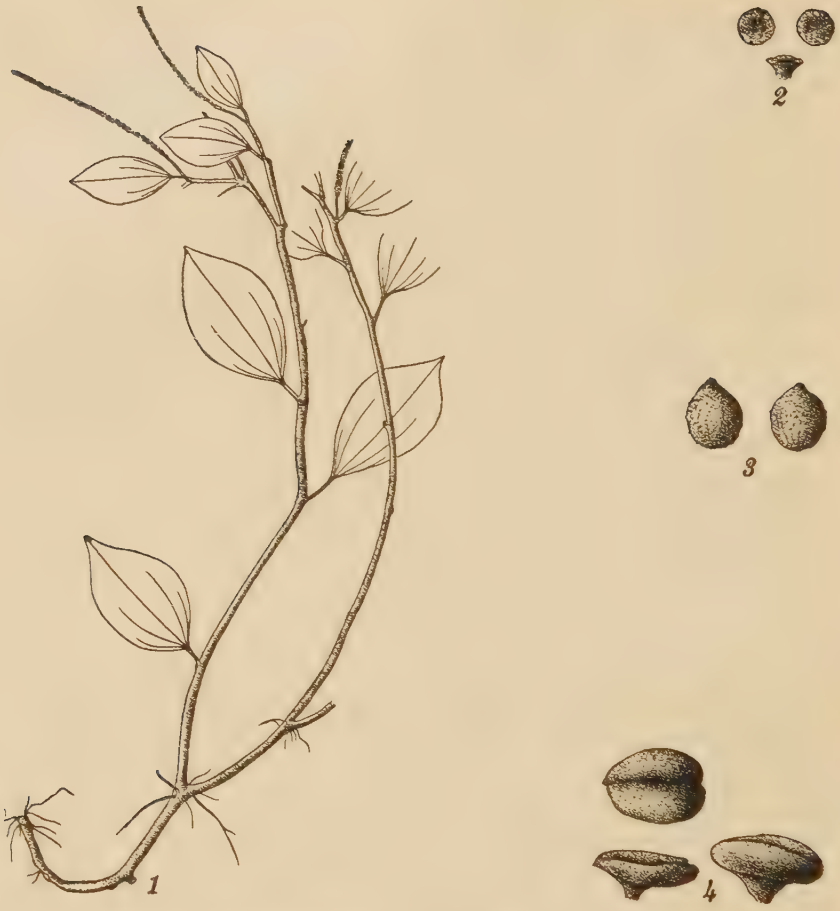

FIG. 111. *Peperomia pellucidopunctalata* C. DC.; *1*, habit sketch of the plant, × 0.5; *2*, top and side views of bracts, × 10; *3*, fruits, × 10; *4*, stamens, × 40.

9. PEPEROMIA AGUSANENSIS C. DC. Text fig. 112.

Peperomia agusanensis C. DC. in Leafl. Philip. Bot. 6 (1914) 2294, Candollea 1 (1923) 349; MERR., Enum. Philip. Fl. Pl. 2 (1923) 18.

Stem erect, glabrous, terete, 24 to 30 cm high, rooting below, dichotomously branched from the base, the branches glabrous, terete. Leaves alternate, oblong-elliptic, 2 to 4 cm long, 1.4 to 2.3 cm wide, base cuneate, 5- to 7-plinerved, apex acute to subacute, chartaceous, opaque, rigid, glabrous and nigro-punctulate on both surfaces, reticulations obsolete; petioles glabrous, usually 4 to 6 mm, sometimes 8 mm long. Spikes erect, usually binate, rarely solitary, axillary and terminal, subfleshy, densely

FIG. 112. *Peperomia agusanensis* C. DC.; *1*, habit sketch of the plant, × 0.5; *2*, fruiting branch, part of main stem, × 0.5; *3*, portion of spike, × 7.5; *4*, top and side views of bracts, × 40; *5*, fruits, × 10; *6*, stamens, × 40.

flowered, 4.5 to 6 cm long; the peduncles glabrous, slender, 8 to 14 mm long; rachis glabrous, subfleshy, 1.25 to 1.5 mm in diameter; bracts subpedicellate, peltate, disk glabrous, orbicular, 0.4 to 0.5 mm wide; stigma terminal, entire, inconspicuous; fruits with the bases immersed in somewhat cupular depressions, ovoid, 0.6 to 0.75 mm long, 0.5 to 0.6 mm in diameter, verruculose, black; stamens pedicellate, anthers ellipsoid, filaments slightly longer than the anthers.

MINDANAO, Agusan Province, Cabadbaran, Mount Urdaneta, *Elmer 13625* (type collection). Endemic.

The alliance of this species is manifestly with *Peperomia laevifolia* (Blume) Miq. from which it is distinguished by its plinerved leaves, its densely flowered spikes, and its black fruits.

10. PEPEROMIA MERRILLII C. DC. Text fig. 113.

Peperomia merrillii C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 411, Candollea 1 (1923) 341; MERR., Enum. Philip. Fl. Pl. 2 (1923) 19.

Stem erect, glabrous, 8 to 20 cm or even 30 cm high, rooting at the nodes near the base, branching sparingly throughout, the branches smooth, glabrous. Leaves alternate, elliptic-ovate to ovate, 2 to 3.5 cm or even 5.3 cm long, 1.5 to 2.5 or even 3.5 cm wide, base acute to rounded, 5-nerved, apex shortly and acutely to obtusely acuminate, membranaceous, subpellucid, glabrous on both surfaces, reticulations not distinct; petioles glabrous, 4.5 to 12 mm long, in the lower leaves up to 25 mm in length. Spike

FIG. 113. *Peperomia merrillii* C. DC.; *1*, fruiting branch, × 0.5; *2*, form of leaves, × 0.5; *3*, lower portion of the spike, × 7.5; *4*, top and side views of bracts, × 10; *5*, fruits, × 10; *6*, stamens, × 40.

solitary, leaf-opposed and terminal, erect, fleshy, more or less densely flowered, 2 to 4.5 cm long; the peduncles glabrous, slender, 2.5 to 7 mm long; rachis glabrous, 1.75 to 3 mm in diameter; bracts subsessile, peltate, disk glabrous, thin, orbicular, 0.5 to 0.6 mm wide; ovaries immersed, ovoid; stigma terminal, more or less inconspicuous; fruits partly immersed in somewhat cupular depressions, globose, umbonate, 0.7 to 0.8 mm long, 0.6 to 0.75 mm in diameter, verruculose; stamens pedicellate, anthers oblong, dehiscence basal, introrse.

LUZON, Cavite Province, Maragondon, *Merrill 4180* (type collection): Rizal Province, Montalban, *Loher 4585;* Bosoboso, *For. Bur. 3359 Ahern's collector, Bur. Sci. 1071 Ramos;* Mount Canumay, *Bur. Sci. 13757 Ramos;* Mount Susong-dalaga, *Bur. Sci. 29319 Ramos and Edaño;* San Andales, *Bur. Sci. 48826 Edaño:* Laguna Province, Los Baños, Mount Maquiling, *Elmer 17800, 18414, For. Bur. 26750 Mabesa:* Sorsogon Province, Irosin, Mount Bulusan, *Elmer 15542, 16179.* On rocks at medium altitudes, ascending to 500 meters. Endemic.

A species certainly close to *Peperomia bilineata* (Blume) Miq., but differing essentially in its globose, verruculose fruits and its membranaceous, subpellucid leaves. It is further characterized by the umbonate apex of its fruits and the peculiar method of dehiscence of the anthers.

11. PEPEROMIA NEGROSENSIS C. DC. Text fig. 114.

Peperomia negrosensis C. DC. in Leafl. Philip. Bot. 3 (1910) 760, Philip. Journ. Sci. 5 (1910) Bot. 412, Candollea 1 (1923) 333; MERR., Enum. Philip. Fl. Pl. 2 (1923) 20.

Stem prostrate, puberulent, rooting at the nodes, branching irregularly, the branches puberulent. Leaves alternate, ovate-lanceolate to elliptic-lanceolate, usually 1.5 to 2.5 cm, sometimes up to 3.5 cm long, 0.7 to 1.4 cm, sometimes up to 2.1 cm wide, base acute, 3-nerved, apex acute, membranaceous, opaque, glabrous on both surfaces, margins and apex ciliate, reticulations not distinct; petioles puberulent, slender, 2 to 4 mm long. Spike erect, solitary or binate, leaf-opposed and terminal, filiform, loosely flowered, short, 8 to 15 mm long; the peduncles glabrous, very slender, 6 to 9 mm long; rachis glabrous, very slender, 0.5 to 0.75 mm in diameter; bracts sessile, peltate, disk glabrous, thin-membranaceous, orbicular, 0.4 to 0.5 mm wide; ovaries immersed, subglobose; stigma terminal, entire; fruits with bases partly immersed in somewhat cupular depressions, globose, 0.5 to 0.6 mm long, 0.5 to 0.6 mm in diameter; stamens pedicellate, anthers globose, filaments longer than the anthers.

NEGROS, Dumaguete, Cuernos Mountains, *Elmer 9425* (type collection), on mossy rocks in shaded ravines. Endemic.

The species is, I believe, allied to *Peperomia exigua* (Blume) Miq., from which it is distinguished by its habit of growth, its puberulent stems and branches and petioles, its ovate-lanceolate to elliptic-lanceolate, opaque leaves, which are ciliate at the margins and apex, and its globose fruits and anthers.

FIG. 114. *Peperomia negrosensis* C. DC.; *1*, habit sketch of the plant, × 1; *2*, fruits, × 20; *3*, top view of bracts, × 80; *4*, top views of stamens, × 80.

12. PEPEROMIA MINDORENSIS C. DC. Text fig. 115.

Peperomia mindorensis C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 413, Candollea 1 (1923) 358; MERR., Enum. Philip. Fl. Pl. 2 (1923) 19.

Stem prostrate or procumbent, pale, densely pubescent, slender, terete, rooting at the nodes, sparingly branched. Leaves opposite or ternate, elliptic-lanceolate, 13 to 25 mm long, 7 to 10 mm wide, base acute, 3-nerved, apex acute, pale when dry,

FIG. 115. *Peperomia mindorensis* C. DC.; *1*, habit sketch of the plant, × 1; *2*, portion of the spike, × 18.

membranaceous, opaque, densely pilose on both surfaces particularly the lower surface, fusco-punctulate beneath; petioles densely pubescent, very slender, 3 to 6 mm long. Spike solitary or binate, usually terminal, rarely axillary, filiform, subdensely flowered, pale when dry, 2 to 4 cm long; the peduncles densely pubescent, very slender, 6 to 9 mm long; rachis glabrous; bracts subsessile, peltate, disk orbicular, 0.6 to 0.75 mm wide; ovaries

immersed in pits; stigma terminal, entire, glabrous; fruits globose, verruculose, about 0.75 mm long, 0.6 mm in diameter, reddish brown; stamens pedicellate, anthers ellipsoid.

MINDORO, Mount Halcon, *Merrill 6107* (type collection), *6184*, on mossy trees, altitude about 1,500 meters. Endemic.

A species belonging in the group with *Peperomia pallidibacca* C. DC., differing in its habit of growth, its elliptic-lanceolate leaves, its globose fruits, and pedicellate stamens.

13. PEPEROMIA ELMERI C. DC. Text fig. 116.

Peperomia elmeri C. DC. in Leafl. Philip. Bot. 3 (1910) 761, Philip. Journ. Sci. 5 (1910) Bot. 412, Candollea 1 (1923) 357; MERR., Enum. Philip. Fl. Pl. 2 (1923) 19.

Epiphytic, the stem weak, pendulous, 30 to 70 cm long, appressed-hirsute, rooting below, the roots reddish, the branches appressed-hirsute. Leaves alternate, remote, elliptic-lanceolate, 2.5 to 5 cm long, 0.8 to 1.5 cm wide, narrowed to the acute apex and base, 3-nerved, membranaceous, opaque, glabrous above, pilose beneath, the younger leaves pilose on both surfaces, margins glabrous, apex ciliate, reticulations not distinct; petioles pilose, slender, 4 to 7 mm, sometimes up to 10 mm long. Spike pendulous, solitary, axillary and terminal, filiform, loosely flowered, 2 to 3.5 cm long; the peduncles glabrous, very slender, 10 to 15 mm long; rachis glabrous, very slender, 0.5 to 0.75 mm in diameter; bracts subsessile, peltate, disk membranaceous, suborbicular to orbicular, 0.5 to 0.6 mm wide; ovaries immersed, ovoid; stigma terminal, penicillate, usually deciduous in mature fruits; fruits with bases partly immersed in somewhat cupular depressions, ovoid to globose, subacute, 0.75 to 0.8 mm long, 0.65 to 0.75 mm in diameter, conspicuously verruculose, dark brown; stamens pedicellate, anthers ellipsoid, filaments longer than the anthers.

MINDANAO, Davao Province, Mount Apo, *Elmer 10493* (type collection), on tree trunks, altitude about 1,200 meters. Endemic.

Local name: Salibútbut (Bag.).

A species characterized by its pendulous habit, its long, weak stems, its solitary, filiform spikes, and by its penicillate stigmas. It probably belongs in the group with *Peperomia negrosensis* C. DC., but is remote from that species.

FIG. 116. *Peperomia elmeri* C. DC.; *1*, habit sketch of the plant, × 0.5; *2*, top view of bracts, × 10; *3*, *a*, young fruit, × 10; *b*, stigma, × 40; *4*, fruits, × 10; *5*, stamens, × 40.

14. PEPEROMIA PELLUCIDA (Linn.) HBK. Text fig. 117.

Peperomia pellucida (Linn.) HBK., Nov. Gen. Sp. Pl. 1 (1815) 64; Miq., Syst. Pip. (1843) 79; C. DC., Prodr. 16[1] (1869) 402, Candollea 1 (1923) 341; Merr., Fl. Manila (1912) 170, Enum. Philip. Fl. Pl. 2 (1923) 20.

Piper pellucida Linn., Sp. Pl. (1753) 30, ed. 2 (1762) 42.

Micropiper pellucidum Miq., Comment. Phyt. (1840) 54.

Peperomia hymenophylla Miq., in Nov. Act. Acad. Nat. Cur. 19 (1843) Suppl. 1: 485, Syst. Pip. (1843) 78.

Micropiper tenellum Klotz. ex. Miq. Fl. Ind. Bat. 1[2] (1858–59) 432.

Stem erect, succulent, glabrous, terete, 20 to 33 cm high including the spikes, dichotomously branched, the branches smooth, terete, glabrous. Leaves alternate, broadly ovate to broadly heart-shaped, 1.4 to 2.8 cm long, 1.5 to 2.6 cm wide, base

Fig. 117. *Peperomia pellucida* (Linn.) HBK.; *1*, habit sketch of the plant, × 0.5; *2*, apex of a leaf, × 7.5; *3*, form of leaves, × 0.5; *4*, lower portion of spike, × 10; *5*, apical portion of spike, × 10; *6*, top and side view of bracts, × 40; *7*, fruits, × 10; *8*, stamens, × 40.

usually subcordate to cordate, sometimes truncate, 5- to 7-nerved, apex shortly and obtusely acuminate, rarely rounded, thin-membranaceous, pellucid, glabrous on both surfaces, reticulations prominent; petioles glabrous, slender, 6 to 10 mm, sometimes up to 15 mm long. Spike solitary, leaf-opposed and terminal, erect, filiform, loosely flowered, 3 to 5 cm long; the peduncles glabrous, slender, shorter than the petioles, 2.5 to 5 mm long; rachis glabrous, slender; bracts subpedicellate, peltate, disk glabrous, thin-membranaceous, orbicular, 0.3 to 0.4 mm wide; stigma terminal, entire; fruits ellipsoid-ovoid to ovoid, rostellate, 0.6 to 0.8 mm long, 0.5 to 0.75 mm in diameter, striate-costulate, glabrous; stamens pedicellate, anthers reniform to oblong-subglobose, filaments shorter or about as long as anthers.

LUZON, Isabela Province, Mount Moises, *Clemens 16697:* La Union Province, San Fernando, *Lete 199*: Pampanga Province, Bacolor, *Parker 23:* Rizal Province, Tanay, *Bur. Sci. 11878 Robinson and Ramos;* Pasig, *Merrill 9785:* Manila, *Meyen s. n.*, Oct. 1831 (type of *Peperomia hymenophylla* Miq. in herb. Berlin), *Elmer 5511, Merrill 87, Reyes 35:* Laguna Province, Los Baños, *Holman 679, Coll. Agric. 19930 Robin.* A pantropic species of American origin, common in the rainy season on and about damp walls in towns and now widely distributed in the Philippines.

Local name: Olasíman-ihalas (C. Bis.).

A species characterized by its erect, succulent stems, its thin-membranaceous, pellucid, reticulate leaves, its elongated, filiform spikes, and its ellipsoid-ovoid to ovoid striate-costulate fruits.

15. PEPEROMIA EXIGUA (Blume) Miq. Text fig. 118.

Peperomia exigua (Blume) MIQ., Syst. Pip. (1843) 77, Nov. Act. Acad. Nat. Cur. 19 (1843) Suppl. 1: 484, Fl. Ind. Bat. 1[2] (1858–59) 432; F.-VILL., Novis. App. (1880) 176; C. DC., Prodr. 16[1] (1869) 403, Leafl. Philip. Bot. 3 (1910) 759, Philip. Journ. Sci. 5 (1910) Bot. 410, Candollea 1 (1923) 328; MERR., Enum. Philip. Fl. Pl. 2 (1923) 19.

Piper exiguum BLUME, in Verh. Bat. Genoots. 11 (1826) 232, *f. 36.*

Micropiper exiguum MIQ., Comment. Phyt. (1840) 55, *t. 9, f. D.*

Stem procumbent, forming dense patches, very slender, rooting at the nodes, glabrous, terete, sparingly branched; the branches glabrous. Leaves alternate, rounded-ovate to broadly heart-shaped, 3 to 8 mm long, 4.5 to 10 mm wide, base truncate to cordate, 5-nerved, apex rounded, thin-membranaceous, subpellucid to pellucid, glabrous on both surfaces, reticulations distinct; petioles glabrous, very slender, 3 to 4 mm long. Spike

FIG. 118. *Peperomia exigua* (Blume) Miq.; *1*, habit sketch of the plant, × 0.5; *2*, leaf and spike, × 7.5; *3*, top view of bracts, × 10; *4*, fruits, × 10; *5*, stamens, × 40.

solitary, axillary and terminal, filiform, somewhat densely flowered, 6 to 11 mm long, 0.5 to 0.75 mm in diameter; the peduncles glabrous, very slender, 5 to 10 mm long; rachis glabrous; bracts sessile, peltate, disk pellucid, orbicular, 0.35 to 0.4 mm wide; ovaries immersed; stigma terminal, bilobed; fruits with bases partly immersed, ovoid, rostellate, 0.35 to 0.5 mm long, 0.3 to 0.45 mm in diameter, glabrous, verruculose; stamens pedicellate, anthers oblong, filaments longer than the anthers.

MINDANAO, Davao Province, Todaya, Mount Apo, *Elmer 11004*. Creeping and forming dense patches on wet ledges or cliffs, in dense woods along Baracatan Creek, at 500 meters altitude. Tropical America, India, and the Malayan Archipelago. The type was from Java.

Local name: Sigbat-ta-pangpang (Bag.).

This species is characterized by its very slender, procumbent stem, its small pellucid, alternate, rounded-ovate to broadly heart-shaped leaves, with rounded apices, its filiform, terminal and axillary spikes and ovoid, verruculose fruits.

16. PEPEROMIA MARIVELESANA C. DC. Text fig. 119.

Peperomia marivelesana C. DC. in Leafl. Philip. Bot. 3 (1910) 762, Philip. Journ. Sci. 5 (1910) Bot. 413, Candollea 1 (1923) 320, 358; MERR., Enum. Philip. Fl. Pl. 2 (1923) 19.

Stem prostrate or decumbent, hirsute, fleshy, usually 9 to 15 mm, sometimes up to 25 mm long, rooting below, sparingly and dichotomously branched, the branches hirsute. Leaves usually opposite, rarely ternate above, usually elliptic-ovate, sometimes

rounded-elliptic-ovate, usually 10 to 20 mm, sometimes up to 30 mm long, 10 to 15 mm, sometimes up to 21 mm wide, base acute, 3-nerved, apex obtuse, membranaceous, opaque, densely hirsute on both surfaces, apex and margins densely ciliate, reti-

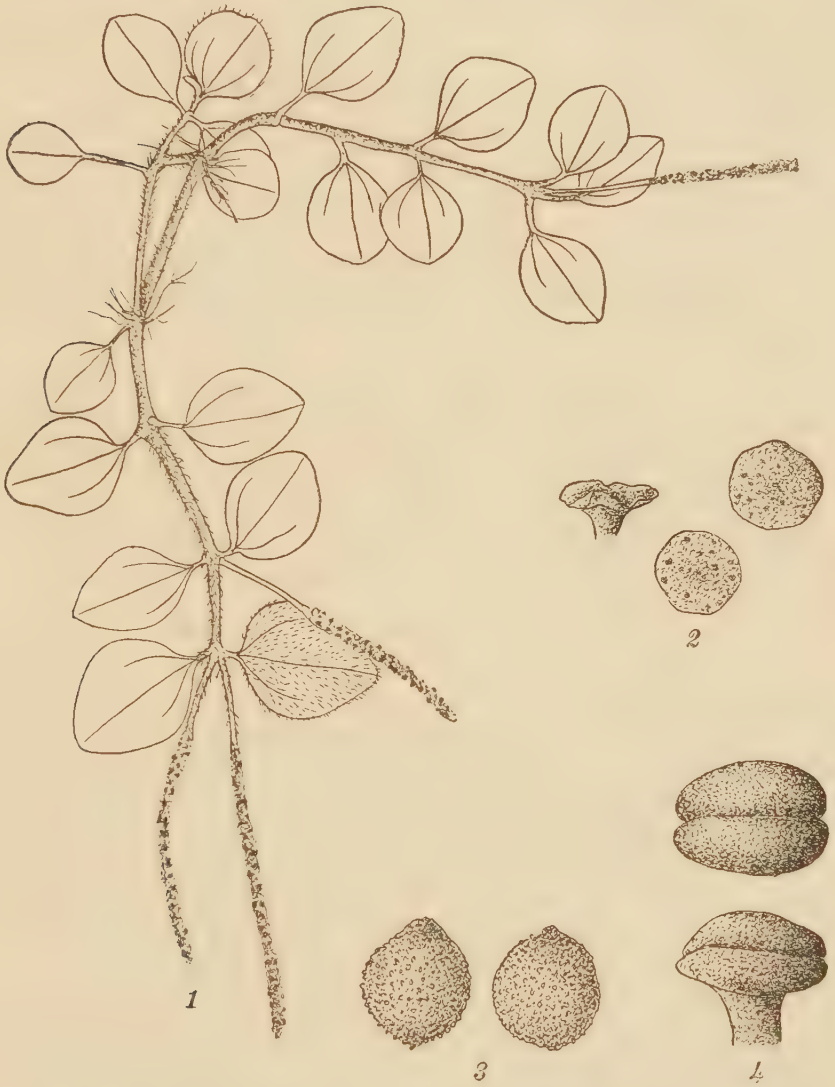

FIG. 119. *Peperomia marivelesana* C. DC.; *1*, habit sketch of the plant, × 1; *2*, side and top views of bracts, × 20; *3*, fruits, × 20; *4*, stamens, × 80.

culations obsolete; petioles densely hirsute, slender, usually 2.5 to 5 mm, very rarely up to 15 mm in length. Spikes erect, solitary or binate, terminal and axillary, fleshy, densely flowered, 3

to 5.5 cm long; the peduncles hirsute, slender, 10 to 15 mm long; rachis glabrous; bracts subsessile, peltate, disk glabrous, orbicular, about 0.5 mm wide; ovaries immersed, obovoid; stigma terminal, entire, globose, glabrous; fruits ovoid, 0.75 to 0.85 mm long, 0.6 to 0.75 mm in diameter, verruculose, brown; stamens pedicellate, anthers ellipsoid, filaments longer than the anthers.

LUZON, Ilocos Norte Province, Mount Nagapatan, *Bur. Sci. 33164 Ramos:* Nueva Viscaya Province, Caraballo Mountains, *De Veyra s. n.* 1916: Bataan Province, Mount Mariveles, *Merrill 3721* (type collection), *3205a, 7618, Bur. Sci. 6210a Robinson, Whitford 313, Elmer 6820:* Laguna Province, Mount Maquiling, *Elmer 17702.* MINDORO, Mount Halcon, *Merrill 6147.* PALAWAN, Mount Victoria, *Bur. Sci. 678 Foxworthy.* On mossy rocks and on tree trunks, at altitudes from 450 to 1,200 meters. Endemic.

This species is allied to *Peperomia rubrivenosa* C. DC. but differs in its leaves being densely pubescent on both surfaces, its terminal stigma, and its smooth anthers.

17. PEPEROMIA TOMENTOSA (Vahl) A. Dietr. var. CARNOSA Miq. Text fig. 120.

Peperomia tomentosa (Vahl) A. Dietr. var. *carnosa* MIQ., Syst. Pip. (1843) 143; C. DC., Prodr. 16[1] (1869) 455, Philip. Journ. Sci. 5 (1910) Bot. 409, Candollea 1 (1923) 320; MERR., Enum. Philip. Fl. Pl. 2 (1923) 21.

Piper tomentosum Vahl var. *carnosum* BLUME in Verh. Bat. Genoots. 11 (1826) 233, *f. 41.*

Stem decumbent, ochraceo-tomentose, fleshy, 11.5 to 16 cm long, rooting below, very sparingly branched, the branches tomentose, opposite or alternate above. Leaves opposite or ternate, subrhomboid-elliptic to subobovate-elliptic, 11 to 23 mm long, 5 to 11 mm wide, base cuneate, 1-nerved, apex subacute to obtuse, chartaceous to subcoriaceous, opaque, ochraceo-tomentose on both surfaces, apex and margins densely ciliate; petioles tomentose, slender, usually 1.5 to 4.5 mm long. Spikes erect, usually binate to quinate, very rarely solitary, terminal and axillary, fleshy, densely flowered, 2 to 3.5 cm long; the peduncles ochraceo-tomentose, slender, 10 to 15 mm long; rachis glabrous; bracts subsessile, peltate, disk glabrous, fleshy, orbicular, about 0.4 mm wide; ovaries immersed, ovoid; stigma a little below the apex, penicillate; fruits with bases immersed in somewhat cupular depressions, ovoid, about 0.6 mm long, 0.5 mm in diameter, verruculose, black; stamens subpedicellate, anthers ellipsoid, filaments slightly longer than the anthers.

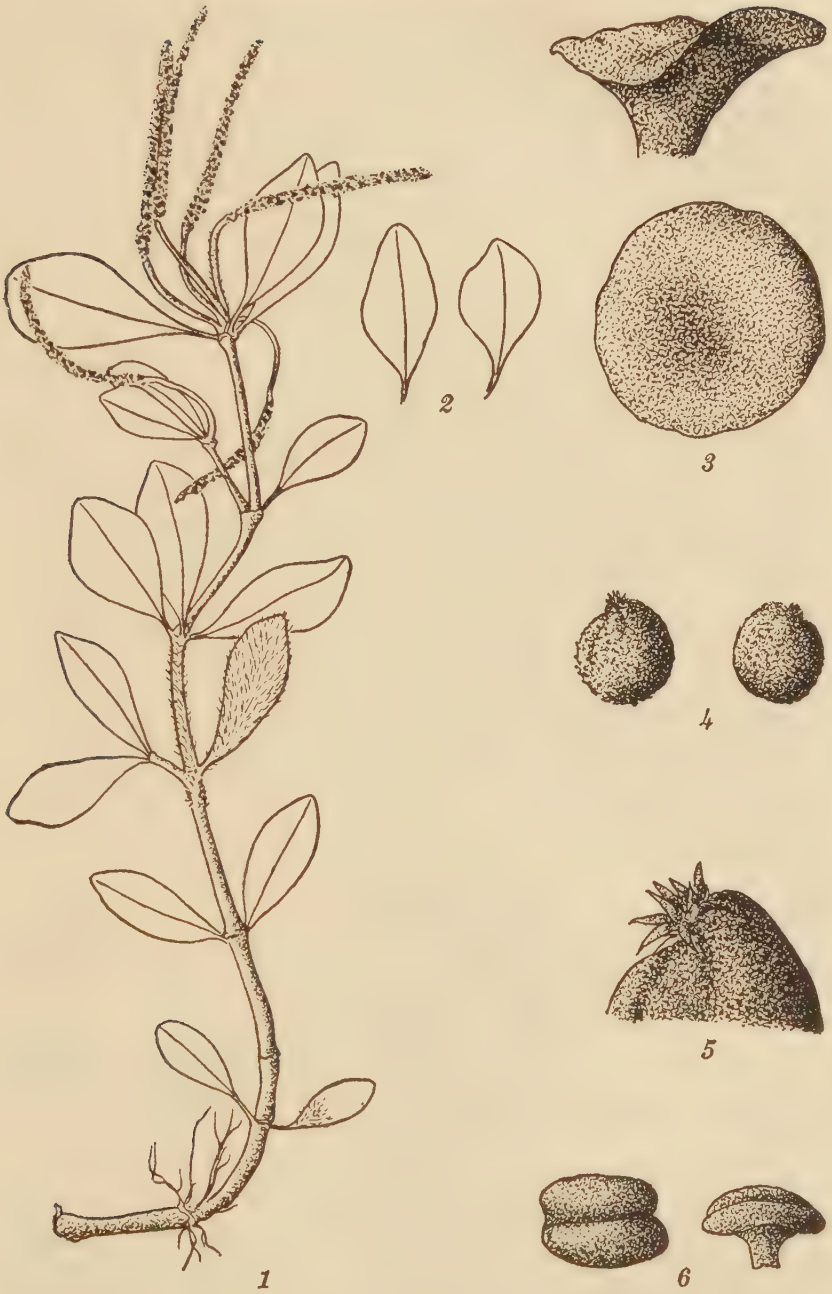

FIG. 120. *Peperomia tomentosa* (Vahl) A. Dietr. var. *carnosa* Miq.; *1*, habit sketch of the plant, × 1; *2*, form of leaves, × 1; *3*, side and top views of bracts, × 80; *4*, fruits, × 20; *5*, detail of stigma, × 80; *6*, stamens, × 80.

MINDANAO, Lanao Province, Camp Keithley, Lake Lanao, *Clemens 517, s. n.* 1906: Bukidnon Province, without definite locality, *Bur. Sci. 15718 Fénix.* Java.

Among the Philippine species, *Peperomia marivelesana* is close to this species. It is characterized by being ochraceo-tomentose throughout, its fleshy subrhomboid-elliptic to subobovate-elliptic leaves, and its penicillate stigmas which are a little below the apex.

18. PEPEROMIA LATIBRACTEATA sp. nov. Text fig. 121; Plate 18.

Herba erecta, basi decumbente, carnosa, tomentosa; foliis oppositis vel ternatis, subobovato-ellipticis ad oblanceolatis 2 ad 4 cm longis, 1.2 ad 1.8 cm latis, basi acutis, 3-nerviis, apice obtusis ad rotundatis, membranaceis, utrinque tomentosis, apice margineibusque ciliatis; petiolis tomentosis, 4 ad 7 mm longis; spicis erectis, solitariis vel binis, rarissime ternis, terminalibus et axillaribus, densifloris, 4 ad 7 cm longis; pedunculis tomentosis, 15 ad 22 mm longis; rachis glabris, carnosis, 1.25 ad 2 mm diametro; bracteis pedicellatis, peltatis, peltis orbicularis, 1 ad 1.25 mm latis, membranaceis, glabris; ovario libero, ovoideo ad subobovoideo; stigmatibus penicillatis; baccis liberis, verruculosis, ellipsoideo-ovoideis, circiter 1 mm longis, 0.75 ad 0.8 mm diametro; staminibus pedicellatis, antheris reniformibus.

Stem erect, decumbent at the base, tomentose, fleshy, 17 to 25 cm high, 1.5 to 2.5 mm in diameter, rooting below, very sparingly branched, the branches tomentose. Leaves opposite or ternate, subobovate-elliptic to oblanceolate, 2 to 4 cm long, 1.2 to 1.8

FIG. 121. *Peperomia latibracteata* sp. nov.; *1*, leaves, × 0.5; *2*, detail of a portion of the spike, × 10; *3*, fruits, × 10; *4*, detail of stigma, × 40; *5*, stamens before dehiscence, × 40; *6*, stamens after dehiscence, × 40.

cm wide, base acute, 3-nerved, apex obtuse to rounded, membranaceous, opaque, tomentose on both surfaces, apex and margins conspicuously ciliate; petioles tomentose, 4 to 7 mm long. Spikes erect, solitary or binate, very rarely ternate, terminal and axillary, fleshy, densely flowered, 4 to 7 cm long; the peduncles tomentose, slender, 15 to 22 mm long; rachis glabrous, 1.25 to 2 mm in diameter; bracts pedicellate, peltate, disk membranaceous, glabrous, orbicular, 1 to 1.25 mm wide; ovaries free, ovoid to subobovoid; stigma terminal, penicillate; fruits free, verruculose, brown, ellipsoid-ovoid, about 1 mm long, 0.75 to 0.8 mm in diameter; stamens pedicellate, anthers reniform, filaments as long as the anthers.

LUZON, Nueva Viscaya Province, Campote, *Bur. Sci. 20126 McGregor* (type), Jan. 15, 1913: Ifugao Subprovince, Mount Polis, *Bur. Sci. 19635 McGregor*, Feb. 11, 1913.

A species closely allied to *Peperomia tomentosa* (Vahl) A. Dietr. var. *carnosa* Miq., differing in its larger, membranaceous bracts, its larger free fruits, its larger leaves, and its terminal stigma.

19. PEPEROMIA RUBRIVENOSA C. DC. Text fig. 122.

Peperomia macgregorii C. DC., in Philip. Journ. Sci. 5 (1910) Bot. 409, Candollea 1 (1923) 408; MERR., Enum. Philip. Fl. Pl. 2 (1923) 21.

Peperomia macgregorii C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 412, Candollea 1 (1923) 358; MERR., Enum. Philip. Fl. Pl. 2 (1923) 19.

Peperomia pauaiana C. DC. in Candollea 1 (1923) 402, *nomen nudum*, 2 (1925) 188.

Stem erect or with procumbent base, sparsely pilose, 18.5 to 30.5 cm high, 1.5 to 2 mm in diameter, rooting below, sparingly and dichotomously branched above, the branches pilose. Leaves opposite, sometimes ternate above, very rarely alternate below, obovate to rounded-ovate, 1.4 to 2.5 cm long, 1 to 2 cm wide, base acute, 3-nerved, apex obtuse to rounded, glabrous on both surfaces to sparsely pilose on both surfaces, apex and margins ciliate, epunctulate, reticulations somewhat distinct; petioles subglabrous to pilose, slender, usually 2 to 4 mm long, rarely 6 mm. Spikes erect, solitary to quaternate, axillary and terminal, fleshy, subdensely flowered, 4.5 to 9.5 cm long; the peduncles glabrous, slender, 8 to 23 mm long; rachis glabrous; bracts subsessile, peltate, disk membranaceous, epunctulate, orbicular, about 0.5 mm wide; ovaries immersed, obovoid; stigma a little below the apex, globose, entire, glabrous; fruits subglobose to globose, 0.8 to 1 mm long, 0.75 to 0.8 mm in diameter, verruculose,

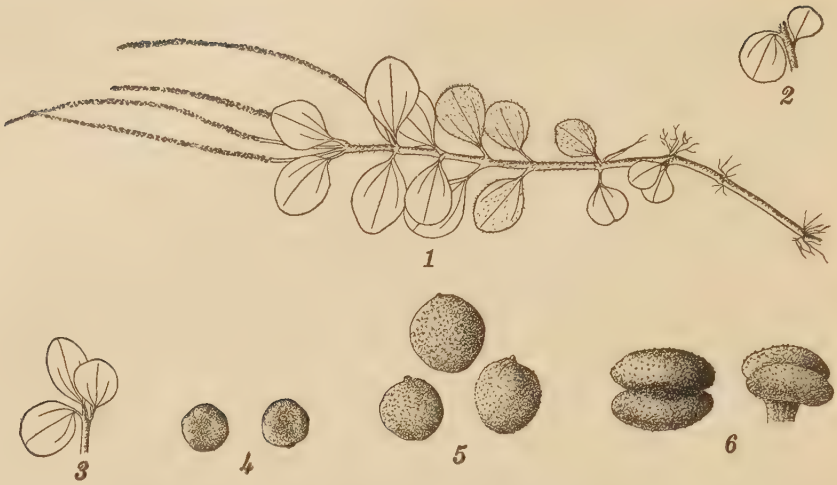

FIG. 122. *Peperomia rubrivenosa* C. DC.; *1*, habit sketch of the plant, × 0.5; *2*, leaves alternately disposed, × 0.5; *3*, leaves in whorls, × 0.5; *4*, top view of bracts, × 10; *5*, fruits, × 10; *6*, stamens, × 40.

brown; stamens subsessile, anthers ellipsoid, hirtellous, filaments slightly longer than the anthers.

LUZON, Benguet Subprovince, Mount Pauai, *Bur. Sci. 8380* (type collection of *Peperomia macgregorii* C. DC.), *8461 Mcgregor* (type collection of *Peperomia pauaiana* C. DC. (*pauaiana*, sphalm); Baguio, *Williams 1083* (type of *Peperomia rubrivenosa* C. DC. in herb. Manila): Rizal Province, Mount Angilog, *Bur. Sci. 42051 Lopez.* On trees at higher altitudes. Endemic.

This species approaches *Peperomia rivulorum* C. DC., but that is a considerably larger and erect plant, with numerous terminal and solitary spikes. The leaves and bracts, furthermore, are epunctulate and the fruits larger, with the stigma situated a little below the top and the anthers hirtellous without.

20. PEPEROMIA LANAOENSIS C. DC. Text fig. 123.

Peperomia lanaoensis C. DC. in Philip. Journ. Sci. 5 (1910) Bot. 410, Candollea 1 (1923) 327; MERR., Enum. Philip. Fl. Pl. 2 (1923) 19.

Stem procumbent, slender, rooting at the nodes, glabrous, sparingly branched, the branches glabrous. Leaves alternate, rounded-ovate, 10 to 18 mm long, 10 to 19 mm wide, base truncate to subcordate, 5-nerved, apex obtuse to rounded, subpellucid to pellucid, glabrous on both surfaces, reticulations prominent; petioles glabrous, slender, 6 to 16 mm long. Spike solitary, leaf-opposed, and terminal, fleshy, densely flowered, 20 to 35 mm long, 1.25 to 2 mm in diameter; the peduncles glabrous, slender,

FIG. 123. *Peperomia lanaoensis* C. DC.; *1*, habit sketch of the plant, × 1; *2*, a leaf, × 1; *3*, top view of bract, × 20; *4*, fruits, × 20; *5*, stamen, × 80.

4 to 8 mm long; rachis glabrous; bracts sessile, peltate, disk pellucid, orbicular, 0.4 to 0.6 mm wide; ovaries immersed; stigma terminal, bilobed; fruits partly immersed, globose, 0.6 to 0.75 mm long, 0.5 to 0.75 mm in diameter, glabrous, verruculose; stamens pedicellate, 0.3 to 0.4 mm long, anthers oblong, filaments longer than the anthers.

LUZON, Rizal Province, Mount Irid, *Bur. Sci. 48500 Ramos and Edaño.* SAMAR, Loquilocon, *Bur. Sci. 43791 McGregor.*

MINDANAO, Bukidnon Province, Tangkulan, *Bur. Sci. 26045 Fénix:* Lanao Province, Maria Cristina Falls, *Clemens 625* (type collection) : Zamboanga Province, without definite locality, *Merrill 8152.* On rocks and ledges in ravines and near streams at low and medium altitudes. Endemic.

A species close to *Peperomia exigua* (Blume) Miq., differing in its fleshy spikes which are leaf-opposed, its larger globose fruits, its larger leaves and longer petioles.

21. PEPEROMIA RIVULORUM C. DC. Text fig. 124.

Peperomia rivulorum C. DC. in Leafl. Philip. Bot. 3 (1910) 762, Philip. Journ. Sci. 5 (1910) Bot. 412, Candollea 1 (1923) 330; MERR., Enum. Philip. Fl. Pl. 2 (1923) 21.

Stem prostrate, hirtellous, somewhat slender, rooting at the nodes, branching below, the branches hirtellous, slender. Leaves alternate, oblong-elliptic to rounded-elliptic, 10 to 20 mm long, 8 to 15 mm wide, base acute, 3- to 5-nerved, apex obtuse to rounded, membranaceous, opaque, puberulent and black-punctulate on both surfaces, margins and apex ciliate, reticulations somewhat distinct; petioles hirtellous, slender, 3 to 8 mm long. Spike erect, solitary, leaf-opposed, and terminal, subfiliform, somewhat densely flowered, 25 to 45 mm long; the peduncles hirtellous, 9 to 15 mm long; rachis glabrous; bracts subsessile, peltate, disk membranaceous, orbicular, 0.5 to 0.6 mm wide; ovaries immersed, oblong-ovoid; stigma terminal, entire, globose, glabrous; fruits oblong-ovoid, 0.6 to 0.75 mm long, 0.5 to 0.6 mm in diameter, verrucose, brown; stamens subsessile, anthers ellipsoid.

MINDANAO, Davao Province, Todaya, Mount Apo, *Elmer 11147* (type collection) ; Catalonan, *Copeland 933.* On mossy bowlders. Endemic.

Local name: Lambu-lambú (Bag.).

The alliance of this species is apparently with *Peperomia lanaoensis* C. DC. from which it is distinguished by its pubescent stems, branches, petioles, peduncles, and opaque leaves with acute bases, and by its long, subfiliform spikes.

EXCLUDED SPECIES

PEPEROMIA ARGYREIA Morren.

Peperomia argyreia MORREN in Belg. Hort. 17 (1867) 2, *t. 2;* MERR., Fl. Manila (1912) 170, Enum. Philip. Fl. Pl. 2 (1923) 21; C. DC., Candollea 1 (1923) 375.

FIG. 124. *Peperomia rivulorum* C. DC.; *1*, habit sketch of the plant, × 1; *2*, top and side views of bracts, × 20; *3*, fruits, × 20; *4*, stamen, × 80.

An exotic species of American origin, now cultivated in Manila and other provinces for its variegated leaves, but giving no indications of becoming naturalized.

PEPEROMIA BILINEATA (Blume) Miq.

Peperomia bilineata (Blume) MIQ., Syst. Pip. (1843) 106, Fl. Ind. Bat. 1[2] (1858–59) 433; C. DC., Prodr. 16[1] (1869) 419, Candollea 1 (1923) 336; USTERI, Beitr. Ken. Philip. Veg. (1905) 125; MERR., Enum. Philip. Fl. Pl. 2 (1923) 21.

Piper bilineatum BLUME in Verh. Bat. Genoots. 11 (1826) 231, *f. 35.*

Usteri's Guimaras specimen was probably wrongly identified. Miquel in Nov. Act. Acad. Nat. Cur. 19 (1843) Suppl. 1: 485, also cites *Manila* as a locality. This species was described from Javan material.

PEPEROMIA MARIANNENSIS C. DC.

Peperomia mariannensis C. DC., Prodr. 16[1] (1869) 442, Candollea 1 (1923) 317; F.-VILL., Novis. App. (1880) 176; MERR., Enum. Philip. Fl. Pl. 2 (1923) 21.

A Guam species erroneously credited by F.-Villar to the Philippines.

PEPEROMIA MEMBRANACEA Hook. and Arn.

Peperomia membranacea HOOK. and ARN. in Bot. Beech. Voy. (1832) 96; C. DC., Prodr. 16[1] (1869) 459, Candollea 1 (1923) 304; F.-VILL., Novis. App. (1880) 176; MERR., Enum. Philip. Fl. Pl. 2 (1923) 21.

A species erroneously credited to the Philippines by F.-Villar. It is reported from Hawaii and Guam.

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ILLUSTRATIONS

PLATE 1

Piper trichophlebium sp. nov.; type.

PLATE 2

Piper medinillifolium sp. nov.; type.

PLATE 3

Piper simile sp. nov.; type. Female plant.

PLATE 4

Piper simile sp. nov. Male plant.

PLATE 5

Piper melanocaulon sp. nov.; type.

PLATE 6

Piper aristolochiphyllum sp. nov.; type.

PLATE 7

Piper fuscinervum sp. nov.; type.

PLATE 8

Piper asterostigmum sp. nov.; type.

PLATE 9

Piper sibulanum C. DC.; type.

PLATE 10

Piper parong sp. nov.; type.

PLATE 11

Piper ensifolium sp. nov.; type.

PLATE 12

Piper cordatilimbum sp. nov.; type.

PLATE 13

Piper longipedicellatum sp. nov.; type.

PLATE 14

Piper paucinerve C. DC.; type.

PLATE 15

Piper spathelliferum sp. nov.; type.

PLATE 16

Piper nigrum Linn. var. *trioicum* (Roxb.) C. DC. (Type of *Piper glabrispicum* C. DC.)

PLATE 17. TYPES OF PISTILLATE SPIKES.

FIG. 1. *Piper interruptum* Opiz.
2. *Piper caninum* Blume.
3. *Piper baccatum* Blume.
4. *Piper sarcopodum* C. DC.
5. *Piper arborescence* Roxb.
6. *Piper philippinum* Miq.
7. *Piper ovatibaccum* C. DC.
8. *Piper betle* Linn.
9. *Piper abbreviatum* Opiz.
10. *Piper baguionum* C. DC.
11. *Piper umbellatum* Linn. var. *subpeltatum* (Willd.) C. DC.

PLATE 18

Peperomia latibracteata sp. nov.; type.

PLATE 19

Piper firmolimbum C. DC.

PLATE 20

Piper abbreviatum Opiz; type.

PLATE 21

Piper interruptum Opiz; type.

PLATE 22

Piper celtidiforme Opiz; type.

PLATE 23

Piper denudatum Opiz; type.

PLATE 24

Piper denudatum Opiz. The spike contained in the pocket, enlarged.

TEXT FIGURES

FIG. 1. *Piper umbellatum* Linn. var. *subpeltatum* (Willd.) C. DC.; *1*, leaf, × 0.25; *2*, top view of bract, × 5; *3*, side view of bract, × 5; *4*, seeds, × 12.5; *5*, stamens, × 40.

2. *Piper arborescens* Roxb.; *1–4*, leaves, × 0.5; *7*, leaf base, upper surface, × 0.5; *8*, leaf base, lower surface, × 0.5; *9*, mature pistillate spike, transverse section, × 7.5; *10*, fruits and seeds, ×7.5; *12*, portion of mature staminate spike, × 5; *13*, side and top views of staminate bracts, × 7.5; *14*, stamen, × 15; var. *angustilimbum* var. nov.; *5–6*, leaves, × 0.5; *11*, fruits, × 7.5.

3. *Piper trichophlebium* sp. nov.; *1*, leaf, × 0.5 *2*, fruits, × 10; *3*, portion of the transverse section of mature pistillate spike, × 10; *4*, mature pistillate spike, × 0.5.

4. *Piper pilipes* C. DC.; *1–2*, leaves, × 0.5; *3*, side and top views of bracts, × 10; *4*, seed, × 10; *5*, fruits, × 10; *6*, mature pistillate spike, × 0.5.

FIG. 5. *Piper brevicuspe* (Miq.) Merr.; *1*, leaf, × 0.5; *2*, apex of a leaf, × 0.5; *3*, mature pistillate spike and stipules, × 0.5; *4*, longitudinal section of a fruit, a bract and three stigmas, × 10; *5*, same with two stigmas, × 10; *6*, staminate spike, × 0.5; *7*, detail of a portion of 6 showing arrangement of bracts, about × 2; *8*, lower view of disk of ♀ bract, × 10; *9*, side view of disk of ♀ bract, × 10; *10*, side view of ♂ bract, × 10; *11*, lower view of disk of ♂ bract, × 10; *12*, hairs on bracts, much enlarged; *13*, stamen, × 10.

6. *Piper medinillifolium* sp. nov.; *1*, leaf, × 0.5; *2*, top and side views of pistillate bracts, × 10; *3*, fruits and pistillate bract, × 7.5.
7. *Piper toppingii* C. DC.; *1–5*, leaves, × 0.5; *6*, transverse section of mature pistillate spike, × 7.5; *7*, side and top views of pistillate bracts, × 10; *8*, fruits, × 7.5; *9*, side view of staminate bracts, × 10; *10*, stamens, × 10.
8. *Piper urdanetanum* C. DC.; *1–3*, leaves, × 0.5; *3a*, mature pistillate spike, × 0.5; *4*, transverse section of mature pistillate spike, × 7.5; *5*, side view of pistillate bracts, × 10; *6*, fruits, × 7.5; *7*, top and side views of staminate bracts, × 10; *8*, stamens, *a*, before dehiscence, *b*, after dehiscence, × 10.
9. *Piper simile* sp. nov.; *1*, habit, male plant, × 0.5; *2*, portion of the transverse section of a mature pistillate spike, × 7.5; *3*, fruits, × 7.5; *4*, side and top views of pistillate bracts, × 10; *5*, habit, female plant, 0.5; *6*, leaf, × 0.5; *7*, top and side views of staminate bracts, × 10; *8*, stamens, × 10.
10. *Piper lessertianum* (Miq.) C. DC.; *1–2*, leaves, × 0.5; *3*, portion of pistillate spike, × 0.5; *4*, fruits, × 7.5; *5*, longitudinal section of fruits and ♀ bracts, × 7.5; *6*, portion of staminate spike, × 0.5; *7*, top and side views of staminate bracts, × 7.5; *8*, stamens, × 10.
11. *Piper lessertianum* (Miq.) C. DC. var. *oblongibaccum* (C. DC.) comb. nov.; leaves, × 0.5.
12. *Piper subprostratum* C. DC.; typical leaves, × 0.5.
13. *Piper subprostratum* C. DC.; *1*, top and side views of pistillate bracts, × 7.5; *2*, fruit, × 7.5; *3*, longitudinal section of a fruit, × 7.5; *4*, top and side views of staminate bracts, × 7.5; *5*, stamens, × 7.5.
14. *Piper decumanum* Linn.; *1*, leaf, × 0.5; *2*, tip of a leaf, × 0.5; *3*, portion of the pistillate spike, × 0.5; *4*, pistillate bract, × 7.5; *5*, young fruit and bract, × 7.5; *6*, fruits and seed, × 7.5; *7*, top and side views of staminate bracts, × 7.5; *8*, stamen, × 7.5; *9*, portion of staminate spike, × 0.5.
15. *Piper lageniovarium* C. DC.; *1*, leaf, × 0.5; *2*, pistillate bracts, × 7.5; *3*, ovaries and stigmas, × 7.5.
16. *Piper majusculum* Blume; *1*, leaf with one side cut, × 0.5; *2*, lobe of the base of a leaf, × 0.5; *3*, tip of a leaf, × 0.5; *4*, stipule, × 0.5; *5*, portion of the pistillate spike, × 0.5; *6*, top

view of portion of the pistillate spike, slightly enlarged; *7*, side and top views of pistillate bracts, × 7.5; *8*, staminate spike, × 0.5; *9*, portion of the staminate spike, × 1.5; *10*, seeds, × 5; *11*, top and side views of staminate bracts, × 7.5; *12*, stamens, × 7.5.

FIG. 17. *Piper eupodum* C. DC.; *1*, fruiting branch, × 0.5; *2*, leaf, × 0.5; *3*, fruit with a bract attached, × 10; *4*, top and apical side views of pistillate bracts, × 10; *5*, top and side views of staminate bracts, × 10; *6*, stamens, × 10.

18. *Piper melanocaulon* sp. nov.; *1*, a fruiting branch, × 0.5; *2*, leaf and mature pistillate spike, × 0.5; *3*, portion of the transverse section of a mature pistillate spike, × 7.5; *4*, side view of pistillate bracts, × 7.5.

19. *Piper agusanense* C. DC.; *1*, leaf, × 0.5; *2*, leaf base, × 0.5; *3*, lower leaf, × 0.5; *4*, mature pistillate spike, × 0.5; *5*, top view of a fruit and a bract, × 7.5; *6*, transverse section of a mature pistillate spike, × 7.5; *7*, mature staminate spike, × 0.5; *8*, top view of staminate bracts, × 7.5; *9*, side view of a stamen, × 40; *10*, median section of two stamens, × 40.

20. *Piper merrillii* C. DC.; *1–2*, leaves, × 0.5; *3*, mature pistillate spike, × 0.5; *4*, submature fruit and bracts, × 7.5; *5*, mature fruit, × 7.5; *6*, staminate spike, × 0.5; *7*, top and side views of staminate bracts, × 7.5; *8*, stamens, × 7.5.

21. *Piper aristolochiphyllum* sp. nov.; *1*, leaf, × 0.5; *2*, staminate spike, × 0.5; *3*, side and top views of staminate bracts, × 7.5; *4*, stamens, × 7.5.

22. *Piper aurilimbum* C. DC.; *1–2*, leaves, × 0.5; *3*, mature pistillate spike, × 0.5; *4*, top and side views of pistillate bracts, × 7.5; *5*, fruit and apices of fruits, × 7.5; *6*, staminate spike, × 0.5; *7*, top and side views of staminate bracts, × 7.5; *8*, stamens, × 7.5.

23. *Piper myrmecophilum* C. DC.; *1*, leaf, × 0.5; *2*, base of a leaf and mature pistillate spike, × 0.5; *3*, fruit with long style and bracts, × 7.5; *4*, detail of bifid stigmas, × 10; *5*, seeds, × 7.5; *6*, detail of a projection from the pistillate bract, × 10; *7*, base of a leaf and mature staminate spike, × 0.5; *8*, top and side views of bracts and stamen, × 7.5.

24. *Piper abbreviatum* Opiz; *1*, flowering branch of a male plant, × 0.5; *2–3*, leaves, × 0.5; *4*, flowering branch of a female plant, × 0.5; *5*, lower leaf, × 0.5, *6–7*, leaves, × 0.5.

25. *Piper abbreviatum* Opiz; *1*, mature pistillate spike, natural size; *2*, top and side views of pistillate bracts, × 10; *3*, portion of the transverse section of mature pistillate spike, × 7.5; *4*, typical seeds and fruit, × 7.5; *5*, larger form of seeds, × 7.5; *6*, top and side views of staminate bracts, × 10; *7*, stamens, ×10.

26. *Piper breviamentum* C. DC.; leaves, × 0.5.

27. *Piper breviamentum* C. DC.; *1*, portion of the transverse section of a mature pistillate spike, × 7.5; *2*, seeds, × 7.5; *3*, side and top views of staminate bracts, × 10; *4*, stamens, × 10.

FIG. 28. *Piper parcirameum* C. DC.; *1–3*, leaves, × 0.5; *4*, top and side views of pistillate bracts, × 10; *5*, fruits, × 7.5; *6*, top and side views of staminate bracts, × 10; *7*, stamens, × 10.

29. *Piper costulatum* C. DC.; *1*, leaf with young pistillate spike, × 0.5; *2*, leaf with mature staminate spike, × 0.5; *3*, base of a leaf and mature pistillate spike, × 0.5; *4*, leaf base, × 0.5; *5*, leaves and young staminate spike, × 0.5; *6*, flowering male branch, × 0.5; *7*, top view of stigmas, × 10; *8*, top and side views of pistillate bracts, × 7.5; *9*, fruits, × 7.5; *10*, portion of the transverse section of a mature pistillate spike, × 7.5; *11*, top and side views of staminate bracts, × 10; *12*, stamens, × 10.

30. *Piper cacuminum* C. DC.; *1*, leaf and mature pistillate spike, × 0.5; *2*, side view of pistillate bracts, × 7.5; *3*, fruit, × 7.5; *4*, top view of a fruit, × 7.5; *5*, seeds, × 7.5.

31. *Piper halconense* C. DC.; *1–5*, leaves, × 0.5; *6*, young fruit with bract attached, × 10; *7*, side view of a pistillate bract, × 10; *8*, mature fruit with bract attached, × 10; *9*, side and top views of staminate bracts, × 10; *10*, stamens, × 10.

32. *Piper atrospicum* C. DC.; *1*, leaf, × 0.5; *2*, leaf and mature pistillate spike, × 0.5; *3*, fruits, × 7.5; *4*, side and top views of pistillate bracts, × 7.5; *5*, portion of the transverse section of mature pistillate spike, × 7.5.

33. *Piper longivaginans* C. DC.; *1–2*, leaves, × 0.5; *3*, detail of petiole, enlarged; *4*, branch, × 0.5; *5*, leaf and mature staminate spike, × 0.5; *6*, mature pistillate spike, × 0.5; *7*, apex of the pistillate spike, × 2.25; *8*, fruits, × 5; *9*, seeds, × 5; *10*, top view of pistillate bracts, × 10; *11*, top view of staminate bracts, × 10; *12*, side view of staminate bract and stamens, × 10.

34. *Piper delicatum* C. DC.; *1*, branch with mature pistillate spike, × 0.5; *2*, flowering branch of a male plant, × 0.5; *3* flowering branch of a male plant, × 0.5; *4*, flowering branch of a female plant, × 0.5; *5*, apex of a pistillate spike, × 2.25; *6*, top and side views of pistillate bracts, × 10; *7*, portion of the transverse section of a mature pistillate spike, × 7.5; *8*, fruits with bracts attached, × 7.5; *9*, seeds, × 7.5; *10*, top and side views of staminate bracts, × 10; *11*, stamens, × 10.

35. *Piper curtifolium* C. DC.; *1–4*, leaves, × 0.5; *5*, portion of pistillate spike, × 7.5; *6*, fruits, × 7.5; *7*, side view of pistillate bracts, × 7.5; *8*, side and top views of staminate bracts, × 10; *9*, stamens, × 10.

36. *Piper varibracteum* C. DC.; *1–2*, leaves, × 0.5; *3*, leaf and mature pistillate spike, × 0.5; *4*, top view of pistillate bracts, × 7.5; *5*, top view of a fruit, × 7.5; *6*, side view of a fruit, × 7.5; *7*, fruit embedded in the rachis, × 7.5; *8*, portion of the staminate spike, × 10; *9*, stamens, × 10.

37. *Piper mindorense* C. DC.; *1*, leaf, × 0.5; *2*, top and side views of pistillate bracts, × 7.5; *3*, fruit, × 7.5; *4*, seeds, × 8.

FIG. 38. *Piper ovatibaccum* C. DC.; *1–2*, leaves, × 0.5; *3*, branchlet with young staminate spike, × 0.5; *4*, branchlet with young pistillate spike, × 0.5; *5*, portion of the transverse section of a mature pistillate spike, × 7.5; *6*, fruit with bract attached and top view of pistillate bracts, × 7.5; *7*, fruits, × 7.5; *8*, seeds, × 7.5; *9*, side and top views of staminate bracts, × 10; *10*, stamens, × 10.

39. *Piper ramosii* C. DC.; *1–3*, leaves, × 0.5; *4* mature pistillate spike, × 0.5; *5*, top and side views of pistillate bracts, × 7.5; *6*, fruits, × 7.5; *7*, seeds, × 7.5; *8*, staminate spike, × 0.5; *9*, side view of staminate bract, × 40; *10*, top and side views of stamens, × 40.

40. *Piper fuscinervum* sp. nov.; *1*, leaf, × 0.5; *2*, mature pistillate spike, natural size; *3*, top and side views of staminate bracts, × 10; *4*, fruit, × 10; *5*, top and side views of pistillate bracts, × 10; *6*, stamens, × 40.

41. Leaves of: *3–5*, *7*, *Piper betle* Linn.; *1*, var. *densum* (Blume) C. DC.; *2*, var. *macgregorii* (C. DC.) comb. nov.; *6*, var. *fenixii* (C. DC.) comb. nov. All × 0.5.

42. *Piper betle* Linn.; *1*, mature pistillate spike, × 0.5; *2*, top view of pistillate bracts, × 10; *3*, stigmas, × 10; *4*, top view of pistillate bracts (var. *densum*), × 10; *5*, trnasverse section of a mature pistillate spike, × 7.5; *6*, seeds, × 7.5; *7*, top and side views of staminate bracts, × 10; *8*, stamens, × 10.

43. *Piper langlassei* C. DC.; *1*, fruiting branch, × 0.5; *2*, longitudinal section of a portion of the pistillate spike, × 7; *3*, bracts, × 7; *4*, stigmas, × 7.

44. *Piper asterostigmum* sp. nov.; *1*, mature pistillate spike and base of a leaf, × 0.5; *2*, portion of the mature pistillate spike, enlarged; *3*, top view of bracts, × 7.5; *4*, stigmas, × 7.5; *5*, seeds, × 7.5.

45. *Piper firmolimbum* C. DC.; *1*, *3–4*, leaves, × 0.5; *2*, fruiting branch with mature pistillate spike, × 0.5; *5*, var. *parvilimbum* var. nov., leaf, × 0.5.

46. *Piper firmolimbum* C. DC.; *6*, transverse section of a mature pistillate spike, enlarged; *7*, top view of pistillate bracts, × 10; *8*, young fruits showing stigmas, × 10; *9*, seeds, × 7.5; *10*, top and side views of staminate bracts, × 10; *11*, stamens, × 10.

47. *Piper longistigmum* C. DC.; *1–2*, leaves, × 0.5; *3*, leaf and a mature pistillate spike, × 0.5; *4*, portion of the top view of a mature pistillate spike, × 7.5; *5*, side view of pistillate bracts, × 10; *6*, side view of a pistillate bract and a young fruit, × 10; *7*, top view of pistillate bracts, × 10; *8*, seeds, × 7.5.

48. *Piper baguionum* C. DC.; *1*, fruiting branch, × 0.5; *2–3*, leaves, × 0.5; *4*, young pistillate spike, × 1.8; *5*, mature pistillate spike, × 0.5; *6*, top and side views of pistillate bracts, × 10; *7*, fruit, × 7.5; *8*, seeds, × 2.5; *9*, portion of staminate spike, × 7.5; *10*, side and top views of staminate bracts, × 10; *11*, stamens, × 10.

FIG. 49. *Piper angustipeltatum* Merr.; *1*, leaf, × 0.5; *2*, pistillate spike, × 0.5; *3*, pistil with long style and bilobed stigma, × 10; *4*, top view of bracts, × 10.

50. *Piper fragile* Benth.; *1–4*, leaves, × 0.5; *5*, mature pistillate spike, × 0.5; *6*, top view of fruits, × 2.5; *7*, side and top views of pistillate bracts, × 10; *8*, portion of the transverse section of a pistillate spike, × 7.5; *9*, portion of a staminate spike, × 10; *10*, top view of a staminate bract, × 10; *11*, transverse section of a portion of staminate spike, × 10; *12*, stamens, × 10.

51. *Piper sarmentosum* Roxb.; *1*, fruiting branch, × 0.3; *2–4*, upper leaves, × 0.3; *5*, lower leaf, × 0.3; *6*, side view of pistillate bracts, × 5; *7*, top view of portion of mature pistillate spike, × 5; *8*, transverse section of mature pistillate spike, × 5; *9*, side view of two fruits, × 5; *10*, side and top views of staminate bracts, × 6.5; *11*, stamens before dehiscence, × 6.5; *12*, stamens after dehiscence, × 6.5.

52. *Piper sibulanum* C. DC.; *1*, leaf, × 0.5; *2*, leaf and mature pistillate spike, × 0.5; *3*, leaf and staminate spike, × 0.5; *4*, top view of a portion of a mature pistillate spike, × 7.5; *5*, seeds, × 7.5; *6*, top and side views of staminate bracts, × 10; *7*, stamens, × 10.

53. *Piper parong* sp. nov.; *1*, leaf, × 0.5; *2*, fruits, × 7.5; *3*, seeds, × 7.5; *4*, top and side views of bracts, × 10; *5*, stamens, × 10.

54. *Piper retrofractum* Vahl; leaves, × 0.5.

55. *Piper retrofractum* Vahl; *1–2*, leaves, × 0.5; *3*, top view of pistillate bracts, × 10; *4*, longitudinal section of a fruit, × 7.5; *5*, mature pistillate spike, × 0.5; *6*, transverse section of a mature pistillate spike, × 7.5; *7*, top and side views of staminate bracts, × 10; *8*, stamens, × 10.

56. *Piper philippinum* Miq.; *1–2*, *4–5*, leaves, × 0.5; *3*, leaf and part of the pistillate spike, × 0.5.

57. *Piper philippinum* Miq.; leaves, × 0.5.

58. *Piper philippinum* Miq.; *1*, portion of mature pistillate spike, × 1.5; *2*, transverse section of a mature pistillate spike, × 7.5; *3*, top and side views of pistillate bracts, × 10; *4*, fruits, × 7.5; *5*, seeds, × 7.5; *6*, transverse section of a staminate spike, × 10; *7*, top and side views of staminate bracts × 10; *8*, sterile ovaries, × 10; *9*, stamens before and after dehiscence, × 10.

59. *Piper albidirameum* C. DC.; *1–2*, leaves, × 0.5; *3*, mature pistillate spike, × 0.5; *4*, staminate spike, × 0.5; *5*, portion of staminate spike, × 2.

60. *Piper maagnasanum* C. DC.; *1–3*, leaves, × 0.3; *4*, longitudinal section of a fruit, × 5; *5*, same, with a bract attached, × 5.

61. *Piper ensifolium* sp. nov.; *1*, leaf, × 0.5; *2*, portion of a young pistillate spike, × 3; *3*, top view of a pistillate bract, × 7.5; *4*, portion of a pistillate spike, × 2; *5*, side view of pistillate bracts and an ovary, × 7.5.

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FIG. 62. Leaves of: *1–2*, *Piper caninum* Blume; *3*, var. *glabribracteum* C. DC.; *4–6*, var. *lanaoense* C. DC.; *7*, var. *oblongifolium* var. nov.; *8–9*, var. *basilanum* C. D.C. All × 0.3.

63. *Piper caninum* Blume; *7*, pistillate spike; *8*, leaves. Var. *hallieri* (C. DC.) comb. nov.; *1–2*, leaves. Var. *latibracteum* C. DC.; *3–6*, leaves. All × 0.3.

64. Fruits of: *1–3*, *Piper caninum* Blume; *4*, var. *glabribracteum* C. DC.; *5*, var. *lanaoense* C. DC.; *6*, var. *oblongifolium* var. nov.; *7*, var. *hallieri* (C. DC.) comb. nov.; *8*, var. *basilanum* (C. DC.) comb. nov.; *9*, var. *latibracteum* C. DC. All × 5.

65. *Piper caninum* Blume; *1*, portion of the pistillate spike showing bracts and rachis, × 7.5; *8*, apex of staminate spike, × 7.5; *9*, side and lower views of staminate bracts, × 7.5; *10*, transverse section of staminate spike, × 7.5. Var. *glabribracteum* C. DC.; *2*, portion of pistillate spike showing bracts, rachis and fruit pedicels, × 7.5. Var. *lanaoense* C. DC.; *3*, top and side views of pistillate bracts, × 10. Var. *oblongifolium* var. nov.; *4*, top and side views of pistillate bracts, × 10. Var. *hallieri* (C. DC.) comb. nov.; *5*, top and side views of pistillate bracts, × 10. Var. *basilanum* (C. DC.) comb. nov.; *6*, top and side views of pistillate bracts, × 10. Var. *latibracteum* C. DC.; *7*, top and side views of pistillate bracts, × 10.

66. *Piper viminale* Opiz; *1*, branch of the male plant; *2*, upper leaf of male plant; *3*, lower leaf; *4*, leaf; *5*, branch of the female plant; *6*, lower leaf; *7–8*, leaves. All × 0.5.

67. *Piper viminale* Opiz; *1*, pistillate spike, × 0.5; *2*, portion of rachis of pistillate spike, × 7.5; *3–4*, fruits, × 7.5; *5*, top and side views of staminate bracts, × 10; *6*, two stamens, × 10; *7*, anthers, after and before dehiscence, very much enlarged. *Piper apoanum* C. DC.; *8*, fruiting branch, × 0.5; *9*, lower leaf, × 0.5; *10*, portion of pistillate spike, × 7.5.

68. *Piper densibaccum* C. DC.; *1*, leaf, × 0.5; *2*, portion of the pistillate spike, × 7.5; *3*, fruit, × 7.5.

69. *Piper dagatpanum* C. DC.; *1*, leaf, × 0.5; *2*, lower leaf, × 0.5; *3*, leaf and pistillate spike, × 0.5; *4*, portion of the pistillate spike, × 7.5.

70. *Piper dipterocarpinum* C. DC.; *1*, leaf, × 0.5; *2*, fruiting branch of pistillate plant, × 0.5; *3*, leaf and staminate spike, × 0.5; *4*, portion of pistillate spike, × 7.5; *5*, portion of staminate spike, × 7.5; *6*, side and top views of staminate bracts, × 10; *7*, stamen, before dehiscence, × 10; *8*, stamens, after dehiscence, × 10.

71. *Piper sablanum* (C. DC.) comb. nov.; *1–2*, leaves, × 0.3; *3–4*, fruits, × 5; *5*, top and side views of pistillate bracts, × 5.

72. *Piper tenuipedunculum* C. DC.; *1*, leaf, × 0.5; *2*, apical portion of branch, showing leaf and peduncle, × 0.5; *3*, top view of pistillate bracts, × 10; *4–5*, fruits, × 7.5.

73. *Piper malalaganum* C. DC.; *1*, branch, × 0.3; *2–3*, leaves, × 0.3; *4*, pistillate spike, × 0.3; *5*, top view of pistillate bracts, × 5; *6*, portion of pistillate spike, × 5; *7*, fruit, × 5.

FIG. 74. *Piper haenkeanum* Opiz; *1–2*, leaves, × 0.3; *3*, branch of a male plant, × 0.3; *4*, leaf, × 0.3; *5–6*, lower leaves, × 0.3; *7–10*, fruits, × 5; *11*, top, lower, and side views of pistillate bracts, × 6.5; *12*, portion of staminate spike, × 6.5; *13*, top view of staminate bracts, × 6.5.

75. *Piper cordatilimbum* sp. nov.; *1–4*, leaves, × 0.3; *5*, ovary, × 6.5; *6*, side view of pistillate bract, × 6.5; *7*, top view of pistillate bracts, × 6.5; *8–10*, fruits, × 5.

76. *Piper cabadbaranum* C. DC.; *1–3*, leaves, × 0.5; *4*, pistillate spike, × 0.5; *5*, side and top views of pistillate bracts, × 10; *6*, portion of pistillate spike, × 7.5.

77. *Piper longipedicellatum* sp. nov.; *1*, fruiting branch with lower portion of pistillate spike, × 0.5; *2*, lower leaf, × 0.5; *3*, top and side views of pistillate bracts, × 10; *4*, portion of pistillate spike, × 7.5.

78. *Piper arborisedens* C. DC.; *1*, leaves, × 0.5; *2*, pistillate spike, × 0.5; *3*, portion of pistillate spike, × 7.5; *4*, fruit, × 7.5.

79. *Piper acutibaccum* C. DC.; *1*, typical leaf and lower portion of pistillate spike, × 0.5; *2*, portion of pistillate spike, × 7.5; *3*, top and side views of pistillate bracts, × 10.

80. *Piper paucinerve* C. DC.; *1*, typical leaf, × 0.5; *2*, portion of the pistillate spike, × 0.5; *3*, top view of pistillate bracts, × 7.5; *4*, fruits, × 7.5.

81. *Piper brevistigmum* C. DC.; *1–3*, leaves, × 0.5; *4*, top view of pistillate bracts, × 10; *5*, fruits, × 7.5.

82. *Piper sorsogonum* C. DC.; *1–2*, leaves, × 0.5; *3*, pistillate spike, × 0.5; *4*, hairs on the bracts, much enlarged; *5*, fruit and portion of the rachis, × 7.5; *6*, top and side views of pistillate bracts, × 7.5.

83. *Piper elmeri* Merr.; typical leaf of the female plant with portion of the pistillate spike, × 0.5.

84. *Piper elmeri* Merr.; *1*, portion of pistillate spike, × 7.5; *2*, top and side views of pistillate bracts, × 7.5; *3*, portion of staminate spike, × 7.5; *4*, top view of staminate bracts, × 7.5; *5*, stamens, × 7.5.

85. Leaves of: *1–3*, *Piper interruptum* Opiz; *4–6*, var. *loheri* (C. DC.) comb. nov.; *7–11*, var. *cumingianum* (Miq.) comb. nov.; *12*, var. *laevirameum* C. DC.; *13–14*, var. *multiplinerve* C. DC. All × 0.3.

86. *Piper interruptum* Opiz; *1*, pistillate spike, × 0.5; *2*, bracts and ovaries on young pistillate spike, × 1.5; *3*, top view of pistillate bracts, × 7.5; *4–5*, fruits, × 2.5; *6–9*, fruits, × 7.5; *10*, longitudinal section of a fruit, × 10; *11*, bracts on the staminate spike, × 3; *12*, portion of staminate spike, enlarged; *13*, top view of staminate bracts, × 7.5; *14*, stamens, × 7.5.

87. *Piper davaoense* C. DC.; *1–4*, leaves, × 0.5; *5*, top view of pistillate bracts, × 7.5; *6*, fruits, × 7.5; *7*, portion of mature staminate spike, × 4.5; *8*, lower and upper views of staminate bracts, × 7.5; *9*, stamens, × 10.

FIG. 88. *Piper pulogense* C. DC.; *1–2*, leaves, × 0.5; *3*, portion of pistillate spike, × 5; *4–5*, fruits, × 7.5; *6*, stamens, × 7.5.

89. *Piper multistigmum* C. DC.; *1*, leaf, × 0.5; *2*, portion of pistillate spike, enlarged; *3*, fruits, enlarged.

90. *Piper spathelliferum* sp. nov.; *1*, leaf, × 0.5; *2*, portion of pistillate spike, × 5; *3*, two fruits and top view of stigmas, × 7.5; *4*, top view of bracts, × 10.

91. *Piper elliptibaccum* C. DC.; *1*, leaf, × 0.5; *2*, pistillate bract, × 7.5; *3*, fruits, × 7.5.

92. *Piper clemensiae* C. DC.; *1*, leaf, × 0.5; *2*, pistillate bract, × 7.5; *3*, fruits, × 7.5.

93. *Piper nigrum* Linn. var. *trioicum* (Roxb.) C. DC.; *1–3*, leaves, × 0.5; *4*, portion of spike, × 7.5; *5*, top view of bract, × 7.5; *6*, stamens, × 10.

94. *Piper korthalsii* Miq.; *1–4*, leaves, × 0.5; *5*, pistillate spike, × 0.5; *6*, part of pistillate spike, with crowded submature fruits, × 0.5; *7*, portion of staminate spike, × 0.5.

95. *Piper korthalsii* Miq.; *1–5*, pistillate bracts, × 7.5; *6–8*, fruits, × 2.5; *9*, portion of staminate spike, × 7.5; *10–14*, staminate bracts, × 7.5; *15–17*, stamens in different views, × 10.

96. *Piper baccatum* Blume; *1–4*, leaves, × 0.5; *5*, portion of immature pistillate spike, × 7.5; *6*, mature pistillate spike, × 1; *7*, staminate spike, × 0.5; *8*, portion of staminate spike, × 7.5; *9*, stamen, greatly enlarged.

97. *Piper sarcopodum* C. DC.; *1–3*, leaves, × 0.5; *4*, pistillate spike, × 0.5; *5*, cupular receptacles and a fruit, × 7.5; *6*, staminate spike, × 0.5; *7*, cupular receptacle with stamens, × 7.5; *8*, stamens, greatly enlarged.

98. Leaves of: *1–3*, *Piper celtidiforme* Opiz; *4–5*, forma *luzonense* (C. DC.) comb. nov.; *6–7*, forma *usteri* (C. DC.) comb. nov.; *8–9*, forma *tubuanense* forma nov., all × 0.3; *10*, var. *vaginans* var. nov., petiole, base of lamina, and young pistillate spike, × 1.

99. *Piper celtidiforme* Opiz; *1*, pistillate bracts, × 10; *2*, stigmas, × 10; *3–4*, fruits, × 7.5; *5*, top and side views of staminate bracts, × 10; *6*, stamens, × 10.

100. *Piper catubigense* Merr.; *1–3*, leaves, × 0.5; *4*, pistillate bract, × 10; *5*, fruits, × 7.5; *6*, top and side views of staminate bracts, × 10; *7*, stamens, × 10.

101. *Piper penninerve* C. DC.; *1–3*, leaves, × 0.5; *4*, top and side views of pistillate bracts, × 10; *5*, fruits, × 7,5; *6*, different views of seeds, × 7.5; *7*, top and side views of staminate bracts, × 10; *8*, stamens, *a*, before dehiscence; *b*, after dehiscence, × 10.

102. *Piper villirache* C. DC.; *1–2*, leaves, × 0.3; *3*, leaf base, × 0.3; *4*, top and side views of pistillate bracts, × 6.5; *5*, fruits, × 5; *6*, top and side views of staminate bracts, × 6.5; *7*, stamens, × 6.5.

FIG. 103. *Piper begoniaefolium* (Blume) comb. nov.; *1*, fruiting branch, with young spike, × 0.5; *2*, mature spike, × 0.5; *3*, fruit, × 7.5; *4*, tips of bristles, × 40; *5*, bract adnate to the base of the pedicel, × 10; *6*, *a*, stamens and bract; *b*, front view of stamen; *c*, back view of stamen, × 10.

104. *Peperomia reflexa* (Linn. f.) A. Dietr. var. *capensis* (Miq.) C. DC.; *1*, habit sketch of the plant, × 0.5; *2*, portion of the spike, × 7.5; *3*, top and side views of bracts, × 10; *4*, fruits, × 10; *5*, detail of the apex of a fruit, × 40; *6*, stamens, × 40; var. *parvilimba* C. DC.; *7*, habit sketch of the plant, × 0.5.

105. *Peperomia pallidibacca* C. DC.; *1*, habit sketch of the plant, × 0.5; *2*, form of leaves, × 0.5; *3*, base of an immature spike, × 10; *4*, top and side views of bracts, × 10; *5*, fruits, × 10; *6*, stamens, × 40.

106. *Peperomia canlaonensis* C. DC.; *1*, habit sketch of the plant, × 0.5; *2*, fruiting branch, × 0.5; *3*, portion of the spike, × 7.5; *4*, top and side views of bracts, × 10; *5*, fruits, × 10; *6*, apex of a fruit, × 40; *7*, stamens, top and side views, × 40.

107. *Peperomia copelandii* sp. nov.; *1*, habit sketch of the plant, × 1; *2*, top and side views of the bracts, × 20; *3*, fruits in different views, × 20; *4*, top and side views of stamens, × 80.

108. *Peperomia recurvata* (Blume) Miq. var. *pilosior* C. DC.; *1*, habit sketch of the plant, × 0.5; *2*, stem, × 1.5; *3*, apex of a leaf, × 1; *4*, top view of bracts, × 10; *5*, fruit, × 10; *6*, side and top views of stamens, × 40; var. *longispica* C. DC.; *7*, habit sketch of the plant, × 0.5; *8*, fruit, × 10.

109. *Peperomia lagunaensis* C. DC.; *1*, habit sketch of the plant, × 0.5; *2*, fruiting branch, × 0.5; *3*, form of leaves, × 0.5; *4*, top and side views of bracts, × 10; *5*, fruits, × 10; *6*, stamens, × 40.

110. *Peperomia laevifolia* (Blume) Miq.; *1*, habit sketch of the plant, × 0.5; *2*, fruiting branch, × 0.5; *3*, form of leaves, × 0.5; *4*, side view of ovary and bract, × 40; *5*, top view of bract, × 40; *6*, fruits, × 10; *7*, stamens, × 40.

111. *Peperomia pellucidopunctulata* C. DC.; *1*, habit sketch of the plant, × 0.5; *2*, top and side views of bracts, × 10; *3*, fruits, × 10; *4*, stamens, × 40.

112. *Peperomia agusanensis* C. DC.; *1*, habit sketch of the plant, × 0.5; *2*, fruiting branch, part of main stem, × 0.5; *3*, portion of spike, × 7.5; *4*, top and side views of bracts, × 40; *5*, fruits, × 10; *6*, stamens, × 40.

113. *Peperomia merrillii* C. DC.; *1*, fruiting branch, × 0.5; *2*, form of leaves, × 0.5; *3*, lower portion of the spike, × 7.5; *4*, top and side views of bracts, × 10; *5*, fruits, × 10; *6*, stamens, × 40.

114. *Peperomia negrosensis* C. DC.; *1*, habit sketch of the plant, × 1; *2*, fruits, × 20; *3*, top view of bracts, × 80; *4*, top views of stamens, × 80.

115. *Peperomia mindorensis* C. DC.; *1*, habit sketch of the plant, × 1; *2*, portion of the spike, × 18.

FIG. 116. *Peperomia elmeri* C. DC.; *1*, habit sketch of the plant, × 0.5; *2*, top view of bracts, × 10; *3*, *a*, young fruit, × 10; *b*, stigma, × 40; *4*, fruits, × 10; *5*, stamens, × 40.

117. *Peperomia pellucida* (Linn.) HBK.; *1*, habit sketch of the plant, × 0.5; *2*, apex of a leaf, × 7.5; *3*, form of leaves, × 0.5; *4*, lower portion of spike, × 10; *5*, apical portion of spike, × 10; *6*, top and side view of bracts, × 40; *7*, fruits, × 10; *8*, stamens, × 40.

118. *Peperomia exigua* (Blume) Miq.; *1*, habit sketch of the plant, × 0.5; *2*, leaf and spike, × 7.5; *3*, top view of bracts, × 10; *4*, fruits, × 10; *5*, stamens, × 40.

119. *Peperomia marivelesana* C. DC.; *1*, habit sketch of the plant, × 1; *2*, side and top views of bracts, × 20; *3*, fruits, × 20; *4*, stamens, × 80.

120. *Peperomia tomentosa* (Vahl) A. Dietr. var. *carnosa* Miq.; *1*, habit sketch of the plant, × 1; *2*, form of leaves, × 1; *3*, side and top views of bracts, × 80; *4*, fruits, × 20; *5*, detail of stigma, × 80; *6*, stamens, × 80.

121. *Peperomia latibracteata* sp. nov.; *1*, leaves, × 0.5; *2*, detail of a portion of the spike, × 10; *3*, fruits, × 10; *4*, detail of stigma, × 40; *5*, stamens before dehiscence, × 40; *6*, stamens after dehiscence, × 40.

122. *Peperomia rubrivenosa* C. DC.; *1*, habit sketch of the plant, × 0.5; *2*, leaves alternately disposed, × 0.5; *3*, leaves in whorls, × 0.5; *4*, top view of bracts, × 10; *5*, fruits, × 10; *6*, stamens, × 40.

123. *Peperomia lanaoensis* C. DC.; *1*, habit sketch of the plant, × 1; *2*, a leaf, × 1; *3*, top view of bract, × 20; *4*, fruits, × 20; *5*, stamen, × 80.

124. *Peperomia rivulorum* C. DC.; *1*, habit sketch of the plant, × 1; *2*, top and side views of bracts, × 20; *3*, fruits, × 20; *4*, stamen, × 80.

PLATE 1. PIPER TRICHOPHLEBIUM SP. NOV.; TYPE.

PLATE 2. PIPER MEDINILLIFOLIUM SP. NOV.; TYPE.

PLATE 3. PIPER SIMILE SP. NOV.; TYPE. FEMALE PLANT.

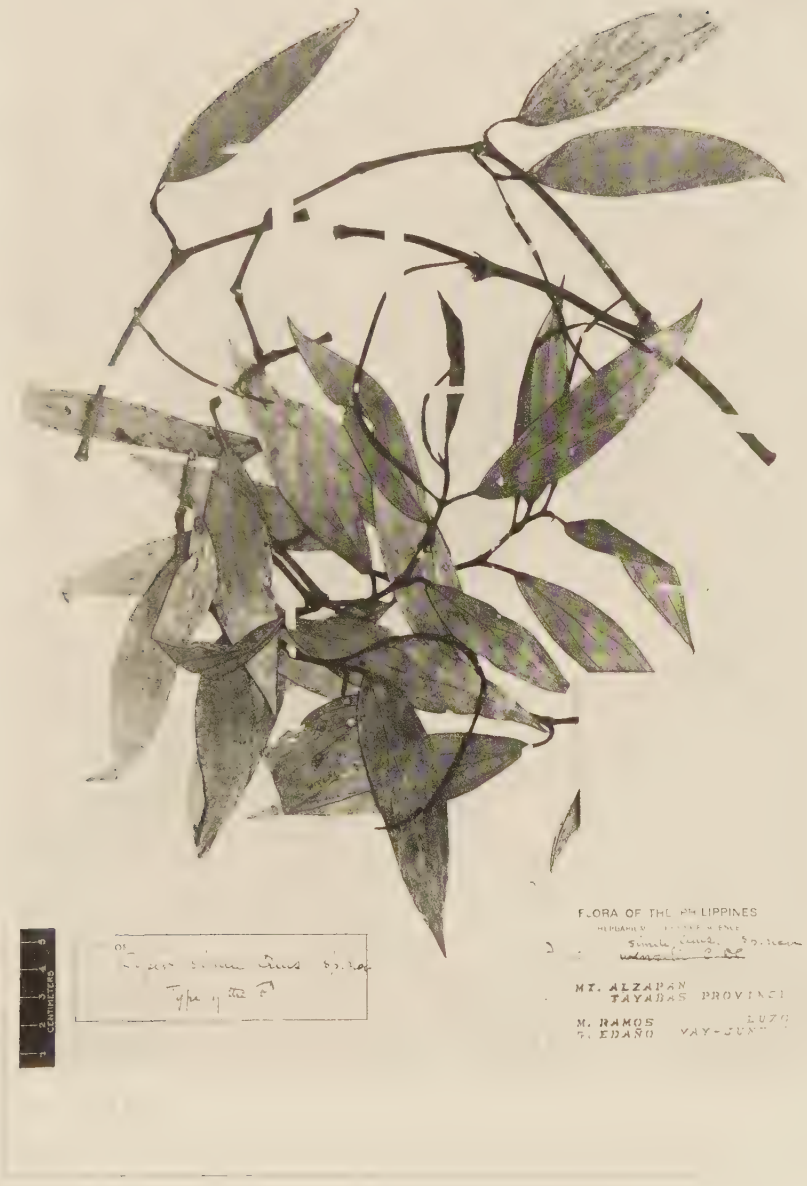

PLATE 4. PIPER SIMILE SP. NOV. MALE PLANT.

PLATE 5. PIPER MELANOCAULON SP. NOV.; TYPE.

PLATE 6. PIPER ARISTOLOCHIPHYLLUM SP. NOV.; TYPE.

PLATE 7. PIPER FUSCINERVUM SP. NOV.; TYPE.

PLATE 8. PIPER ASTEROSTIGMUM SP. NOV.; TYPE.

PLATE 9. PIPER SIBULANUM C. DC.; TYPE.

PLATE 10. PIPER PARONG SP. NOV.; TYPE.

PLATE 11. PIPER ENSIFOLIUM SP. NOV.; TYPE.

PLATE 12. PIPER CORDATILIMBUM SP. NOV.; TYPE.

PLATE 13. PIPER LONGIPEDICELLATUM SP. NOV.; TYPE.

PLATE 14. PIPER PAUCINERVE C. DC.; TYPE.

PLATE 15. PIPER SPATHELLIFERUM SP. NOV.; TYPE.

PLATE 16. PIPER NIGRUM LINN. VAR. TRIOICUM (ROXB.) C. DC. (TYPE OF PIPER GLABRISPICUM C. DC.)

PLATE 17. TYPES OF PISTILLATE SPIKES.

PLATE 18. PEPEROMIA LATIBRACTEATA SP. NOV.; TYPE.

PLATE 19. PIPER FIRMOLIMBUM C. DC.

PLATE 20. PIPER ABBREVIATUM OPIZ; TYPE.

PLATE 21. PIPER INTERRUPTUM OPIZ; TYPE.

PLATE 22. PIPER CELTIDIFORME OPIZ; TYPE.

PLATE 23. PIPER DENUDATUM OPIZ; TYPE.

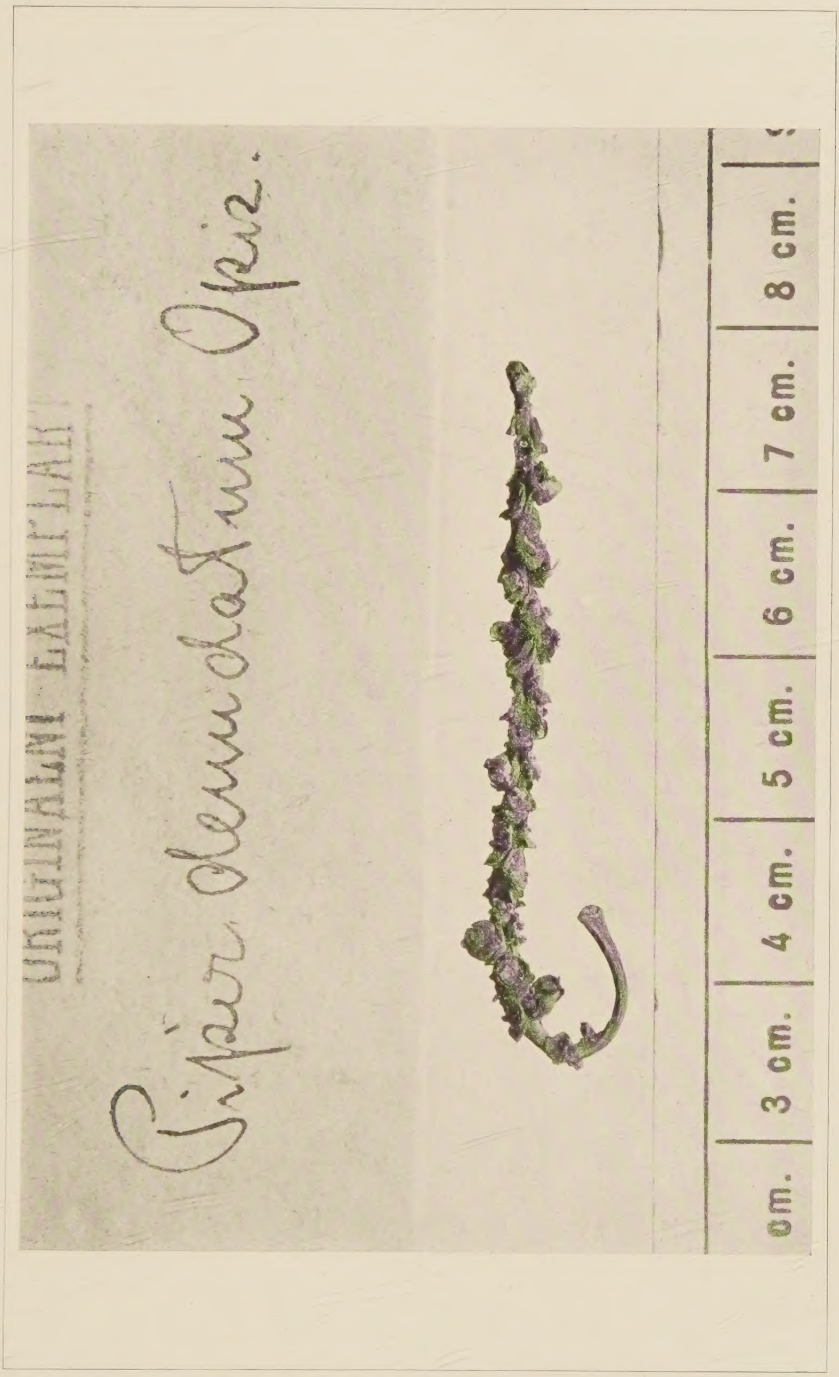

PLATE 24. PIPER DENUDATUM OPIZ. THE SPIKE CONTAINED IN THE POCKET, ENLARGED.